WAGE INCENTIVES

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PREFACE

The prominent position occupied today by wage incentives as a means of increasing production for war has been viewed with mixed feelings by many of us who for a number of years have worked directly with their use and application.

Believing in incentives, we are pleased to see them being generally recognized and accepted again as a major tool of industrial management. Believing in them also causes us to fear greatly for them, in that their suddenly renewed wide popularity may once again bring on the mistakes and misuses that caused them once before to fall into great disfavor in the eyes of both management and labor.

In an effort to plead the cause of incentives by attempting to tell their story in a balanced manner, I have written this book. In doing so I have written primarily for the man of management and the man of labor rather than for the engineer. I want to tell these two groups as briefly and concisely as I can what incentives really are and what they can really do. In the understanding which management and labor have of their use and in their balanced perspective the success or failure of incentives lies.

I have endeavored to avoid excessive technical details without sacrificing clearness and understandability. Rather than review the many ramifications of various incentive plans and their uses I have chosen to hew to a straight line, emphasizing policies, relationships, controls, and the like, which to my mind have been less understood and appreciated than the technical details of the various wage incentive plans.

Not only have I tried to place before management and labor what I believe to be, and have found to be, the proper bases and concepts of incentives, but I hope I have also armed the engineer who is responsible for this work in his company with arguments and data to support his stand for sound, well-designed incentive plans. In writing to both management and

labor I have outlined a common ground or basis for the development and installation of incentive plans that will be acceptable to both and will permit their use, thus allowing both groups to reap their benefits. If I have accomplished these ends, I shall feel that I have achieved my purpose in preparing this book.

In fairness to my company, I wish to state that the content of this book represents the free thinking of the author and does not necessarily conform to the practice and policies of the Armstrong Cork Company.

As is any author of a book such as this, I am indebted to many friends and associates with whom I have worked and whom I have known through the years. I am particularly indebted to Mr. G. Donald Louden and to Mr. P. K. Shoemaker for their specific comments and criticism of the material presented. I am indebted also to Mr. Paul A. Cooper and Mr. J. W. Deegan for their assistance with the source material on which Chapters X and XI are based, and to Mr. W. L. Sybert and Mr. Deegan for their assistance in the preparation of the manuscript.

J. K. LOUDEN

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Chapter I

A BRIEF HISTORY OF WAGE INCENTIVES

Their Inception

The Taylor System. The foundation of modern wage incentive plans and the techniques used in developing them were laid by Frederick W. Taylor at the Midvale Steel Company in the early 1880's. They grew out of his desire to overcome the " systematic soldiering " which he found there. This soldiering was an evil that was inherent in the practice of " bringing a number of men together on similar work and at a uniform rate of pay by the day."[1] Since all were paid the same, the poorest worker tended to establish the amount of output.

Mr. Taylor further found a more pernicious form of soldiering brought about by piece rate systems in effect at that time. These piece rates were set usually on the foreman's estimate. If excessive earnings were made, the rate was cut. Therefore there was constant conflict between management and workers. The workers attempted to gauge their work to earn as much as they could without getting the rate cut while the management tried to induce the workmen to increase their output as much as possible to obtain lower costs.

Mr. Taylor realized that the chief difficulty lay in the fact no one knew what constituted a fair day's work. Therefore he set out to establish a method or system whereby piece rates could be based, not on their actual performance in the shop, but on facts as revealed by careful investigation. Thus was born Taylor's " scientific method in connection with

[1] *Frederick W. Taylor,* by F. B. Copley, Vol. 1, Book III, Chapter 1, page 208, Harper & Bros., New York.

management," which grew to be known as the Taylor System.[2]

Overdemand for the Taylor System Led to Misuse. The success which Mr. Taylor's work had and the publicity which it received caused it to be more and more sought after by companies throughout the country. The advent of the First World War, which just preceded Mr. Taylor's death in 1915, and the pressure for increased production created a demand for the services of his associates greater than they could meet.

This overdemand for the services of trained qualified men laid open the profession of industrial engineering, as it is now known, to the untrained opportunists, to " efficiency experts " with little if any qualifications, and to others whose prime motive was to " cash in " on this new profession. Industry and industrial engineering will be a long time recovering from the evils wrought during the years 1915 to 1930, and they have already paid a heavy price.

The past decade has seen substantial improvements in this work. Two important factors have brought this about, management's growing realization of what constitutes sound practice in this work, and the demands by organized labor for sound, fair wage practice.

The evils of the 1915 to 1930 period have had such far-reaching effects and will continue to influence future thinking on the part of both management and labor to such a degree that it is advisable to consider at least the most common ones here. I have chosen the following ten, which, in my mind, are the greatest of these evils.

1. Failure to have supervision play a major role in the program and failure to train supervisors in the fundamentals of industrial engineering

To fail to recognize the fact that the foreman is the manager of his department seems inexcusable in the light of sound management thinking. Management must not fail to recognize that, if the foreman is not " sold " on the project, or does not understand

[2] *Frederick W. Taylor,* by F. B. Copley, Vol. 1, Book III, Chapter 1, page 217, Harper & Bros., New York.

it, his men will realize this fact and will be against it also. Nothing can wreck the morale of a department more than ignoring its supervisor or forcing something unknown upon him.

This failure led to conflicts between the supervision and the people making the study. These conflicts usually resulted in loss of shop morale and led to such common beliefs as " the engineers are coming in to tell the foreman how to run his department."

2. Failure to enlist cooperation of employees and to gain their full understanding and confidence

This failure is as obviously unsound as failing to work with and for the foreman and demonstrates a lack of concept of what constitutes sound employee relations. It probably grew primarily out of the incompleteness of techniques, lack of personal competency, and general unsureness on the part of the people making the installation. They wrapped themselves in a shroud of mystery and, with an airy " this is something you couldn't understand," sowed the seeds of bitter resistance and opposition to this work.

3. Failure to recognize the caliber of men and the competency required to perform this work

The performance of industrial engineering functions by untrained or inadequately trained men is a fault that must be shared by both management and practicing engineers. The desire of management to get the job done at as low a first cost as possible, plus their own lack of knowledge of what was involved, was a major cause. The lack of truly competent engineers and the lack of college curricula designed specifically to train men for this work were other factors.

Fortunately management generally has come to realize the importance of this function and is now more willing to set it up properly and to staff it with competent people. Yet we have not, today, more than approached the point in our thinking where the preaching of the doctrine of having sound competent engineers can be lessened. If any management is not willing to set up this industrial engineering function properly and man it with competent people, then they are not in themselves ready for such a program and should not have it.

4. Failure to establish standard procedures and policies governing industrial engineering

This includes not only the use and application of the techniques of industrial engineering but also the application of results obtained, such as a wage incentive plan. The establishment of

standard techniques in a detailed manner for all engineers in a company is still not a common practice. Yet if uniformity of results is to be obtained, it is essential.

Written policies governing wage incentives were usually vague if existing at all. These problems were frequently left to the whims of the department heads and the heads of the payroll departments. The pattern followed was often one of inconsistency with its resultant confusion and discontent. The content and form these policies governing incentive plans can take will be discussed at length in a later chapter.

5. Failure to realize that industrial engineering consists of more than taking time studies and installing a wage incentive system

If one evil had to be selected as the greatest, it would be hard to deny the place to this mistaken concept. The old practice of going into a department, taking the layout, methods, and equipment virtually as it was, then establishing standards for wage incentive purposes has been completely discredited. In those cases no organized effort was made to eliminate waste. No organized effort was made to standardize methods of performing work and then training the workers in those methods.

The fact that the true purpose of a wage incentive plan is to sustain the goals reached through proper layouts, proper work methods, proper equipment, and well-trained employees was not recognized. Instead, the goal of increased production and lower costs was sought by setting standards on the jobs as they were found and then hoping that they would be attained by offering a financial incentive. Too often this left the average worker with no device other than increased effort to meet these standards, which, in turn, led to discontent and opposition to incentives. Some workers through their own ingenuity improved their work methods to the point where meeting the standard was no particular chore. This only intensified the opposition of those less ingenious. What a blind approach this was to the problem, but fortunately its practice is rapidly diminishing.

6. Failure to guarantee standards once established against change unless there is a change in method, equipment, or specification

This evil was rate cutting. As above-average workers forced their earnings beyond what was considered the top by the foreman or the plant management, the rate would be cut. This soon led

to the workers putting ceilings on their output in self-protection.

Even after rates began to be guaranteed some guarantees were vague and meaningless. The policy on this point must be clear-cut and rigidly adhered to if it is going to be acceptable to the workers. The practice of making a minor change in method, and then materially changing the standard, is not acceptable. If any change is made that affects a standard, only that portion of the standard involved should be altered, and then only to the proper degree. If changes are made on any other basis, they should be made only with the full knowledge and agreement of the employees concerned.

7. Establishment of a ceiling on incentive earnings above which an employee must not go or the standard will be cut

The only advantage this practice had over plain rate cutting was that it saved the employees the trouble of learning by trial and error what the ceiling was. In the light of modern knowledge it seems inconceivable that such short-sighted practices existed.

The only ceiling that should ever exist on a properly set standard is that of the best efforts of the highest-skilled, most ideal worker on that job. There are exceptional workers who will exceed the highest expectations on earnings. Management must recognize them and consider itself thrice blessed that they are on its payroll.

8. Failure to analyze and establish standards for materials and spoilage

Failure to establish proper standards and controls over material usage as well as to establish the expected amount of spoilage led to confusion and strong differences of opinion. Often through excessive use of materials unusually high production could be obtained. Yet in many cases the value of the material used was greater than the cost of the labor involved. This same point held true for spoilage. Production would go up, but the increase in spoilage more than offset the gains made. The attempt of management to remedy this omission after the installations were in often led to the charges of rate cutting.

9. Failure to establish rigid specifications and quality standards

This is similar to the evil listed above. When proper quality standards were not clearly established, production increases were often obtained at the expense of quality. When attempts were

made to overcome this lack, strong differences of opinion often arose as to what was the preinstallation quality, or what constituted acceptable quality. Here again it is essential that such problems be settled before the installation is made.

10. Failure to maintain properly and regularly measured standards and wage incentive installations once they are established

The rigid maintenance of an incentive plan is essential if it is going to be successful. It used to be common practice to forget all about an incentive plan after its initial installation except for annual, or some other set period, check-ups. At these periodic intervals, attempts were made to take up all the slack that had occurred in the interim.

This meant that loose standards were tightened for no apparent reason other than that a date had been reached. The changed conditions that made the standard loose may have been in effect for months. It was very difficult to convince the average worker that the standard should be changed at that later date. The opposite situation of a standard's no longer being adequate was also found. Thus the plan had become unbalanced and ill fitting, with all the problems of fair administration such a situation involves.

No matter how carefully and completely the installation and all that went before are made, the conditions that exist at the time will not remain static. To keep everything in balance and to maintain as high a degree of coverage as possible require that the installation be perpetually maintained. Every change in specification or method should be followed up immediately with the effect on existing standards measured. If it is a controllable change, its effect on standards and quality should be checked before it is made. The fine results of a good piece of work could soon be dissipated by the lack of proper maintenance with probable general dissatisfaction.

These evils and pitfalls that were once common take on special significance today when demands for increased output have again overabsorbed the market of trained industrial engineers. Companies which have not used incentives on any scale are being urged to make use of them as production aids. It is wise that they consider well the results of ill-advised haste in the past.

Growth and Development of Wage Incentives

As incentives became more and more popular, various plans were offered to industry. These plans usually embodied some particular idea or feature that made them different from the others. During that period virtually all the emphasis was placed on the *plan* rather than the *foundation* upon which the plan rested. In the attempt to overcome the deficiencies of lack of motion study in the full sense, sound time study, and the like, complexities were introduced that tended to level off wide swings in earnings. The result was that under some of the plans few workmen could calculate their own earnings or understand how they were calculated. This condition did not aid their reception by the workers or the foremen.

Today, with our more advanced techniques and greater experience, the trend is to keep the plan itself as simple as possible and to take care of the variables by measuring and controlling them. The majority of plans that were prominent fifteen or twenty years ago are virtually non-existent today. However, some are still in use to a limited degree, and the principles involved in others have carried through to become integral parts of present practices. Piece rates in their various forms are still probably the most common type of incentive plan. However, bonus plans using time standards rather than money standards are displacing them in many companies.

The early practice of having a very low guaranteed base rate when incentives were used, plus that of having a day work base rate and a lower incentive base rate for the same job, have disappeared as a result of legislation and more sound wage policies. The latter device was designed primarily to guard against excessively high earnings on poorly and inadequately set standards. Improved techniques and greater experience have removed any excuse for using such a protective device today.

To illustrate changes in thinking further, we can recall the

day when the worker at best only vaguely knew what his earnings were until he received his pay. Today it is sound practice to post incentive earnings every day in the shop for all to see.

Depression Years Saw Abandonment of Incentive Plans. In the economic depression of the early 1930's there was a strong tendency in many industries to abandon incentive plans of all types and return to day work or some form of measured day work. The cause of this reversal can be traced to a number of factors. The low volume of production in many industries made it very difficult to provide sufficient work to encourage the men to produce. Then, too, management was seeking every means to reduce overhead, and their incentive system and the people required to operate it were among the early victims in some companies. The added desire to spread the work and hold keymen often made incentive plans meaningless and unprofitable to maintain.

In many cases a major factor in their elimination was the revolt of organized labor in its new-found strength against ill-designed and poorly administered incentive plans. This attitude made itself doubly felt when the depression was over and times were more normal. Many companies have yet to get incentives back on any scale, and the progress they have made has been slow and painful.

Looking back on the broad industrial picture, we see that the elimination of incentives in many companies was a blessing in disguise. It not only wiped the slate clean of hopelessly involved and inadequate incentive installations but it also forced many managements to alter their concepts and policies regarding incentive plans materially.

Difficulties Faced in Rebuilding Incentive Plans. The arbitrary attitude held by some unions that incentives are against the common good of all workers makes it doubly difficult for some managements again to offer incentives to their employees, this in spite of their willingness to make the plan fair and equitable. Past mistakes made by management provide much of the ammunition used by such union leaders,

but, in spite of that, incentives are once more on the ascendancy.

Regardless of one's personal opinion of incentives, it is difficult to deny that a soundly conceived and executed incentive plan is the best and most satisfactory method yet devised to recognize and reward individual differences in workers on the same operation. The problem facing management is one of so planning, organizing, and administering their incentive systems that even the most arbitrary labor leaders cannot equitably deny their soundness and fairness. This can be done and must be done if management is going to be able to achieve lower costs and at the same time recognize and reward workers whose rate and quality of output justify such an award. The time required and difficulties faced in obtaining full acceptance of incentive plans can best be determined by a study of a company's past practices and policies governing their use.

Regardless of any individual's or group's basic attitude toward incentive plans, there is one major factor that strongly affects the degree of its acceptance. This factor is the volume and backlog of work facing a plant. Workers are markedly more receptive to incentive plans when the volume of work is on the ascendancy than when it is starting to diminish. The reason for this is obvious. Yet if the incentive idea is sound, it should be not merely a prosperity device. Other ways and means must be found to offset the factor of " spread the work to make jobs." The price that must be paid in attempting to revitalize and equalize an incentive plan that has been permitted to decay and fall apart is very high from both a cost and employee relations standpoint. Accordingly, companies who experience wide swings in their production volume cycles must give this problem of proper maintenance during low production periods serious attention in their use of incentive plans.

It might be said that, on the whole, we are now emerging from the dark ages in the use of incentive plans as an integral part of a sound industrial engineering program. We find

their use being advocated by government, management, and labor. While not condoning past practices and mistakes, we must not be blindly critical. Every profession has learned the hard way of trial and error. The important point is that those who have made, and are making, real progress *do learn* from their past mistakes. It then behooves management, labor, and industrial engineers to view the position of wage incentives in the industrial picture objectively. *The success or failure of incentives lies in their combined abilities to understand their nature, place, and use.*

Dangers Faced by Wage Incentives Today Due to Abnormal Emphasis

The War Production Board's Wage Incentive Recommendations. First of all, it should be pointed out that the War Production Board's recommendations are not made blindly. Mr. Wilson, in an article clarifying his recommendations, points out that there are recognizable limitations to any such plan.[3] He first of all states the need for reasonable standards. He recognizes the difficulty involved and the impracticability of applying an overall plant bonus plan to a plant making diversified products. For these plants he recommends the application of one of the more standard types of incentive plans.

This whole program breaks down into two important parts from the standpoint of incentives. One is the use of incentives in a war plant as a war measure and the second is their use in a peacetime plant that will be reconverted after the war. They should be considered as two separate problems since what may prove the expedient thing to do in a war plant would be the wrong thing to do in a peacetime plant working on a war basis.

The average war plant, built as such, is a single-product plant that will not produce that product when the war is over. Furthermore, the plant itself as a manufacturing entity

[3] "How to Get Production Back on Schedule," Charles E. Wilson, *Factory Management and Maintenance,* September, 1943, pages 82–86.

might cease to exist. Here we have a short-range problem of obtaining maximum production within a minimum of time. The long pull is of no moment. In fact the prime purpose of that plant is, as quickly as possible, to produce itself out of existence through hastening the end of the war.

No one can find fault with the basic principle of war wage incentives as stated by the War Production Board. That principle is: " If it can be shown that a ten per cent increase in production over *reasonable standards* [italics are the author's] has been secured in a given plant, then the entire working force in that plant should receive a bonus of exactly ten per cent." In the illustration of what is meant by " reasonable standards " the example is given of the number of man-hours at *normal working speeds* [italics are the author's] required to produce a specified number of bombers. If during a working period a number of bombers greater than that specified is produced utilizing the same number of man-hours, a bonus is paid to all workers in direct proportion to this increase in production.

As stated, no one can quarrel with that principle. But the question can and must be raised of how that " reasonable standard " is going to be established. The statement is made by Mr. Wilson that this overall plan " eliminates the time-taking technical task of setting up time study measurements for individual performance." On that basis, unless detailed standard data exist, and we can safely say that they do not, we must assume that the reasonable standards are based on past performance, or the unmeasured judgment of an individual or group of individuals. Past experience has proved beyond the shadow of a doubt that *neither* of those bases is an acceptable one for the purpose of establishing work standards that will meet the tests a successful incentive plan must meet.

Any basis other than careful measurement by time study is suitable only for the establishment of goals, *not* standards. From a sound industrial engineering standpoint, this distinction is of major importance. The history of wage incentives

shows that it is this very basis that led to practices and conditions which placed sound wage incentives in a bad light and led to their failure and discredit.

Establishment of Production Goals as a War Measure, and Their Limitations. As a wartime measure the establishment of production goals on an arbitrary or bargained basis, the exceeding of which results in a financial award, is undoubtedly justified under certain conditions and under recognizable limitations. The general acceptance of this basis as a sound one on which to build an equitable wage incentive plan would be a major mistake on the part of any management. It is not offered as such, and management must not accept it as such.

The desire to increase production of planes, tanks, and guns in single-purpose plants that will exist only during the war period can justify these production goals. The inequities of effort required on the part of individuals and groups of workmen within a single plant to exceed the goals may not become a vital issue since it is a war measure. The inequities of effort required between similar plants will probably not become well known. The freezing of labor costs at levels other than the right one based on methods of production will not be too serious since the goods are not manufactured for sale in a competitive market. The whole wage structure in war plants is so inflated over what was normal that the relationship between effort expended and wages received is distorted so that the significance of these goals as measurements of individual efforts may be lost.

On the other hand, as a device to be used in plants continuing to make their regular or related products for war purposes and that would continue in operation after the war, the use of such goals is decidedly not an acceptable practice. It is recognizably difficult to make such a flat statement as this, but it is the only sound basis on which to start and the burden of proof should be wholly on the other side.

We should consider this emphasis on incentives from the continuing manufacturer's viewpoint from two angles. The

first is the use of overall plant production bonus plans. Since the vast majority of plants are multiproduct plants rather than single-product, we can dismiss this measure as being impractical. Its most ardent proponents as a measure of war expediency recognize this limitation and do not recommend it under such circumstances. The second measure, which would carry the incentive idea into departments by setting up departmental goals, also does not hold because of the nature of most plants. In multiproduct plants we usually find the combination product-process layouts used. Thus it becomes a complex problem to determine equitably each department's output on such a general basis. To select one or two departments out of a plant where it could be applied would be unwise from a labor relation's standpoint. Recognizing all the problems inherent in trying to use such a plan in this type of plant, the War Production Board does not advocate it so we need not consider it further.

Time Study Is the Only True Basis for Incentive Standards. The second and most important consideration is using any device other than careful, accurate time study or time study data as a basis for setting standards. Let us first define the fundamental purpose of an incentive system. *It is to offer a financial incentive for a worker or group of workers to produce work of an acceptable quality over and above a specified quantity.*

The success or failure of the plan depends primarily upon the fairness and accuracy with which the "specified quantities" or standards are set and whether or not they are guaranteed against unsupportable and unjustified changes. Other factors are important, as we will discuss later, but the heart of the plan is the standard. Every worker must know and believe that his task requirements are comparable within reasonable limits with those of every other worker. He must know that, regardless of the part or job he is assigned to work on, the requirements are comparable within those same reasonable limits with any other part or job that may be assigned him. He must know that, regardless of his performance

under those standards, if all conditions remain the same as specified at the time the standards were established, the standards will not be changed.

To be able to give a worker those assurances obviously requires that the standards be based upon facts. The only way these facts can be gathered is through careful detailed analytical studies. They cannot be based on past production records. They cannot be based upon rumors of what other plants are doing. They cannot be based upon the estimates or unsupported judgments of any individual or groups of individuals, no matter how experienced they may be in their knowledge of the work to be performed. The history of wage incentives is strewn with the wreckage of plans based on just such foundations as these. No matter how well intentioned the individuals responsible for the plan may be, they cannot overcome the inherent complexities and variables that are part of production with anything other than measured facts.

Not only must a wage incentive plan be carefully installed but it must also be rigidly maintained. If the installation is faulty and non-factual, then there is lacking a solid foundation for the proper maintenance of the plan. Regardless of the good intentions of both workers and management, inequalities in rates are bound to be resented. Thus starts the old vicious cycle of equalizing out-of-balance rates. This, by its very nature, becomes an upward spiral in time allowed until all rates become meaningless from a task viewpoint. Unless backed by sound facts and properly administered, every rate represents an incipient disagreement between the foreman and his men. This situation could so harm their relationship that it would take years to overcome it.

No matter how alluring the prospects of obtaining more production quickly may appear to the manager who will still be running his plant after the war, he must not succumb to any urging that he put in wage incentive plans based on anything other than measured standards. If he does succumb he will see the day when he realizes that no incentive plan is

far better than one poorly conceived and maintained. He will find himself either faced with discontent and bitterness on the part of the workers if a real attempt is made to keep rates somewhat in line or saddled with rates so much higher than they should be that he is no longer competitive from a labor cost standpoint.

If neither time nor trained engineers are available to make the installation in a proper manner, then other devices designed to encourage increased production should be devised. Whatever they may be and whatever their output goals may be, every care should be exercised to make it clear that they are *not* standards and they are *not* incentive plans. Care should also be taken to make certain that the device is sufficiently different from any incentive plan that may be used, so that at no future date could anyone refer to the wartime production contest for comparative purposes.

Wage incentives are not a panacea or cure-all. When used properly they are a valuable tool of management. It behooves all of us to do everything we can to keep them in their proper perspective.

Chapter II

RELATIONSHIPS OF WAGE INCENTIVES TO OTHER PHASES AND FUNCTIONS OF MANAGEMENT

Hourly Rate Structure

Since a wage incentive plan is designed to offer a financial incentive for a worker to produce work of an acceptable quality over and above a specified quantity, it presupposes that the worker will be fairly and adequately compensated for his efforts and output up to and including that specified quantity.

This basic payment for work performed is usually called the base or job rate. Such a rate should be established for each operation in the plant and grouped by class of operation. The establishment of equitable compensation for the performance of each occupation and operation in a plant is not a simple problem. It requires the best thought and effort available. It must not be left to chance or to the uncoordinated opinions of supervision and department heads.

An equitable wage or rate structure must meet several requirements. It must determine by job analysis what are the jobs or occupations in the plant and what distinct measurable classes of each exist. It must relate by job descriptions and job evaluation the value of each job and class of job to all others within the plant itself on a scalar or class basis. It must relate the value of all jobs and classes of jobs to wages paid for like work in the community and in the industry as a whole in order that rates may be kept in balance and the plant remain competitive for obtaining good workers. It must take into account the ability of the company to pay. The fundamental question that must be answered is the rank

or relationship of each job to all others in the plant. All other considerations rest upon the successful determination of this basic foundation.

In the past the value placed on jobs has been established in many ways and influenced by many and varied factors. When the foreman alone valued the jobs in his department, he may have kept them low in an effort to be a low-cost department. The employer, too, may have looked upon wages as the answer to most of his employee relations problems and used them freely to answer complaints and grievances, recognize ability, length of service, and other extraneous factors. The pressure of unions has induced inequalities of different types, depending largely on whether or not they are craft or vertical unions, and whether or not there is more than one bargaining agent in the same plant.

Development of a Rate Structure Program. Keeping in mind that the purpose of a job evaluation and hourly rate structure program is to provide equitable compensation for all work performed based on the requirements of that work, we can outline the attaining of that purpose generally in these steps:

1. The selection of an adequate plan of job evaluation and the establishment of the method of approach

There are many plans of different complexities and degrees of satisfaction in use today. One that has proved to have a high degree of acceptability involves the combining of the job-ranking or classification system and the point-evaluating system. The two approaches complement each other and, in my opinion, a more satisfactory result is obtained by their combined use than by their sole individual use, as both the word definitions and the numerical definitions guide the analyst.

2. The selection of key jobs in the plant to serve as bench mark jobs in evaluating all jobs

These jobs are ordinarily selected on the basis of their stability as to duties and requirements, their commonness in industry generally, their being recognizable and familiar to almost everyone in the plant, and their inclusion of a substantial portion of the hourly personnel in the plant.

3. The preparation of detailed job descriptions first on the key jobs and then on all others

The answer being sought is job content – what is the job? The description must present a clear picture of the function of the job and a record of the significant characteristics on which is based the evaluation of the job. The characteristics or factors on which the job is evaluated usually include the following:

A. Training and experience required.
B. Mental abilities required.
C. Complexity and variety connected with the job.
D. Dexterity and physical skill required.
E. Responsibility for care of material or product.
F. Responsibility for equipment or process.
G. Responsibility for safety of others.
H. Responsibility for leadership.
I. Physical effort required.
J. Mental effort required.
K. Safety and health hazards.
L. Working conditions.

4. Ranking and evaluating first the key jobs and then all the other jobs in the plant

It is here that the relative values are determined for each individual job and then for all jobs in relation to each other from a job content and requirement standpoint only. Money as yet has not entered the picture. If money is considered here, then immediate comparisons with present rates becloud the issue to a serious degree.

5. The preparation of a wage scale based on going rates in the plant, industry, and community is now required

This wage scale is first tested against the key jobs, at which time its adequacy is determined. Once established, it is applied against all the jobs in the plant in accordance with their previously determined classifications. These rates then become the amount of money paid to anyone who works on that job and can meet the minimum requirements of the job.

There are many secondary uses and results of this program. There is the use of the job descriptions for selection, hiring, and training purposes. There are the development of a definite plan of promotion from one job to another, the de-

velopment of standard job titles, and the encouragement of better supervision. The important point is that a fair wage has been established for the performance of work. This fair wage can be used as the basis upon which incentive payments can be made. These incentive payments are to be based on performance against standards alone and are in no way affected by or related to the content of the job in question.

Relationship between Wage Incentives and Rate Structure. In the past, incentives were sometimes used as a means of increasing a man's earnings without changing the base rate of the job when that base rate was considered to be too low. That misuse of the incentive idea not only contributed to the loss of favor for incentives but also seriously complicated and distorted the base rate structure in the plant.

Incentives and rate structures must be kept entirely separated in their preparation and determination. The rate structure analyst has no interest in whether or not the job will be placed on incentive because that point should have no bearing on the proper evaluation of the job and the establishment of the base rate for it. The engineer installing the incentive plan has no interest in what the base rate of the job is since it has no bearing on the establishment of the proper standard. Should the incentive plan be piece rates, then the engineer obtains the rate structure after he has established his standards and converts these standards into terms of money, using the rates shown in the rate structure.

If both the rate structure and the incentive plan have been accurately and equitably established, we have the ingredients of a successful and harmonious wage practice and experience. To obtain this harmonious and successful relationship both must be developed carefully and equitably. They must be not only acceptable to, but also supported by, both the supervision and the hourly employees. They must believe in them, and the best way to achieve this is to make the supervisors and employees major partners in their development.

Motion Study

Keeping in mind that the primary purpose of an incentive plan is to be a sustaining mechanism and not an attaining mechanism, we see that it is important to consider the relationship between motion study and wage incentives. Motion study, or work simplification, or job standardization, *has to do with the analysis of work to be performed in order to reduce it to its simplest accomplishment.* This analysis may result in the elimination of the job in question, its combination with other jobs, or its simplification through the elimination of waste effort and motions.

It is here that the great savings through cost reduction are obtained. Often in the past, when it was felt necessary to reduce prices or lower costs, one of the first things thought of was to reduce wages. Realizing that this approach also reduced purchasing power as well as caused labor unrest, employers have sought other means. The idea of cost reduction through waste elimination was explored and has since taken such firm root and experienced such growth and acceptance by both management and labor that the reduction of wages to meet falling sales or rising costs would now be a measure only of desperation.

Although the use of motion study has become widespread, its full possibilities in industry as a whole have yet to be explored. Progress has been and is being made, but the period of its greatest growth and application still lies ahead.

Problems in the Use of Motion Study. The major obstacles in the way of motion study in the past have been a lack of appreciation and understanding of its possibilities by both management and labor, a lack of trained engineers, and the opposition of both supervision and labor to it as a major factor in technological change. The manner and timing of its application often have had much to do with its lack of acceptance. The disruption of skills, the de-emphasis of the importance of a job, and the learning of new methods of work have caused opposition and confusion.

The present practice of making both supervision and

hourly employees major factors in the development of such a program has been important in its recent rapid growth. Then, too, improved training practices and techniques have aided materially in overcoming operator resistance to the new methods. The education of supervisors and key hourly workers in the possibilities of motion study, plus a sound policy designed to minimize the economic effect of the results obtained to the individual worker, have been important and essential steps.

The growing practice of a number of companies to submit all new operations and processes to a thorough study before their installation, so that the simplest and best-organized methods that can be devised at that time are included in the original installation, is doing much to reduce the degree and amount of change made in established work methods. This is desirable from a labor relations standpoint and is decidedly good practice not only from an operator response and training aspect but also from a rate structure and incentive viewpoint. Under this practice the possibility of changes in job content or performance standards within a relatively short period of time is minimized.

Relationship between Wage Incentives and Motion Study. The ideal most plant managers seek is operating a high-wage, low-cost plant. There are many factors that enter into attaining that condition, but one of the most important is waste elimination. When an employee is hired he is selling to the employer his skill, knowledge, and effort. He has only so much of each to expend in a given period of time in terms of effort. If part of this is spent on ineffective or unnecessary work, it is sheer waste. Therefore it is management's responsibility to analyze thoroughly all work performed to reduce it to its simplest terms and thus obtain maximum utilization of the effort purchased from and expended by his employees. Thus the employee has the knowledge and the satisfaction that he is doing effective work, and one of the principal ingredients of a low-cost, high-pay plant is at hand.

The relationship between incentives and motion study is here shown in sharp relief. The foundation of a wage incentive plan is the standard work requirement. This standard is based, or should be, on careful work measurement by time study. The time study analyst measures the work on the basis of the manner in which it is being performed. If the work is not fully organized, if it has not been subjected to the searching analysis of motion study, then there is certain to be much waste effort and many waste motions inherent in the manner in which it is being performed.

The time study analyst under such circumstances is forced to attempt to evaluate work performed under a variety of methods, with varying amounts of unnecessary and ineffective work present. Standards set under these circumstances are certain to force some of the workers, at least those who themselves have not worked out simple motion patterns, to work faster and perform all elements of the operation at a higher speed, including those elements which should not be in the operation. This has in the past led to the cry of " speed up," and rightly so.

When the operation has been analyzed and simplified, and the operators trained in the new methods and following them, then the time study analyst is in a position to do a better job. He does not have to cope with a variety of methods and unnecessary or ineffective motions. He is in a position to establish a more accurate standard and one that, when coupled with a wage incentive plan, offers financial encouragement for the worker to follow the new method, to prevent old waste motions from creeping back in, and to maintain or better a standard output of acceptable quality with a minimum of waste material and tools.

Although it is difficult to lay down an absolute policy, since some exception can always be cited, nevertheless I believe that a sound one is: *No standards shall be established on an operation for incentive purposes until that operation has been subjected to a study involving the use of these*

methods improvement techniques and the result of that study placed into effect in a satisfactory manner.

Time Study Standards and Standard Data

Since the standard established by time study as the measurement of the amount of work required to perform an operation is the heart of any incentive system, it is important that this relationship be discussed.

We have discussed the importance of motion study in this picture so we can assume that the operations have been simplified, organized, and the operators trained in the new methods. We are now ready to establish standards of performance governing that work. These standards are not to be what a superior worker or a below-average worker can do but what we expect a normal worker to do in the performance of his job. This worker must possess the required normal physical, mental, and skill attainments specified for the job. These standards must be set on a fair, honest, and equitable basis, not requiring excessive concentration and exertion but at the same time requiring an average day's output.

Major Bases Used in Establishing a Standard. There are two major bases that the time study analyst uses in establishing this measured work standard. One basis is his judgment of the amount of work contained in the operation; the other is the comparison of the elements of work found in the operation with similar or identical elements of work found in other operations whose measured standards have been proved in actual practice. The analyst can use these proved elemental standards to check his judgment, or if he has sufficient elemental standards available he may develop the work standard from these elemental data and use the time study analysis only as a check on his standard constructed from this proved standard data.

Here we have the desired goal in the time study process — the development of standard data based on elemental time

standards proved in actual practice that will permit developing or constructing standards on new operations. Then using the time study technique only as a check on the elements involved, we can develop such additional data as are required to maintain properly the completeness and accuracy of the standard data tables. However, this development and this use of standard data, with a few exceptions, are in their infancy among companies in this country. Therefore the majority of companies are forced to rely almost entirely on data developed by actual time studies made specifically to establish that standard on that operation.

Major Uses of Time Study Standard Data. There are many different methods of taking time studies, but I shall not take time here to discuss the relative merits of the more common methods. Rather let us consider some of the major uses made of standard data developed by time study. They are:

1. Basis of standards used for establishment of wage incentive plan.
2. Basis of standards used for developing standard costs.
3. Basis of standards used in developing operating budgets.
4. Making cost estimates.
5. Data in redesigning plant layouts, process equipment, and products.
6. Basis for the development of standard data for use in all departments and plants.
7. Preparing production schedules and plans.

To develop data that are used for such a variety of purposes requires that each study be made in detail and with accuracy. It requires that each study be made by a competent trained analyst. That it be done so is vital from both a cost and a labor relations standpoint.

The Judgment Factor in Time Study. The major bone of contention regarding time study is the adjusting of the study to normal operating conditions and normal operating meth-

ods and pace in comparison with those witnessed and recorded during the study. This is primarily a matter of judgment on the part of the analyst in that he must estimate the extent to which the operator or operators studied have deviated from the analyst's concept of standards. It is obvious that this variable becomes all important in establishing a standard, and yet under existing methods and knowledge we must expect an average error ranging from 5 to 10 per cent, depending upon the nature of operations studied — and this by experienced and competent analysts.

This margin of error and the known lack of uniformity between analysts have been sources of considerable concern to industrial engineers and have been the subject of strong attacks by labor unions. It is a complex problem, and yet to date little has been done on a broad national scale to study the problem and establish bases and data that can serve as the foundation of uniformity.

A committee was established under the auspices of the Society for the Advancement of Management just prior to the war to make a formal objective study of this problem. Unfortunately, because of war conditions the committee was forced to suspend the study, but it plans to resume it as soon as conditions permit. There is a great need for such data and information. It is the duty of management to recognize this need and its importance and to support such studies as will permit attaining this necessary precision in establishing standards. Until this is done there is little hope for substantial broad improvement in this matter, and management will be constantly faced with a strong questioning attitude on the part of labor regarding the precision with which standards are established. In the meantime, pending the development of these data and information, engineers must bend every effort toward attaining a full measure of accuracy and uniformity of standards.

Properly trained workmen are a material aid since the analyst in studying a proficient worker has fewer variables to consider. It is also important that a sufficient number of

operators working on the same operation be studied to give the analyst greater confidence in his conclusions. The constant checking of one engineer with another as to their common concepts of work requirements in relation to time standards at least tends toward attaining uniformity in this respect within that plant and company and should be a regular company practice.

The recognition by management of the caliber requirement of the competent industrial engineer and time study analyst, plus the realization of the degree of training they require before being considered competent, are important if we are going to attain the desired precision in the matter of establishing measured work standards.

Summary of Requirements for Accurate Work Standards. We might summarize the principal points upon which the attaining of uniform accurate standards depend as follows:

1. The proper organization of the job based on the findings of thorough and complete motion studies.
2. The proper training of the operator in the new method of work.
3. The competence and ability of the engineer making the study.
4. The degree of accuracy attainable under the particular time study procedure and techniques used.
5. The proper and constant maintenance of standards in accordance with changes introduced into the operations.
6. The adherence of new standards as they are developed to the established normal output level to the degree possible, using present methods and techniques.

The Problem of Uniformity Where Inaccurate Standards Exist. In this struggle to attain uniformity and precision in establishing work standards we are constantly faced with the problem of reconciling standards established under what we may term modern techniques with those established in the past under some outmoded and abandoned practice such as past averages or the foreman's estimate.

If there is a wide difference in old and new standards on comparable operations, and there probably is, then a strong labor relations angle enters the picture. It might be that the unions will exert pressure for some loosening of the new standard at least to approach the old standard if not actually meet it. Yet to yield in this point on some specific operation or group of operations throws the whole basis of uniformity out of balance and sets off a series of repercussions that can completely unbalance the entire concept of accurate standards in that plant.

Therefore management must hold firm to its basis for and concept of uniform standards against such pressures. Other means of reaching an agreement with the unions on these discrepancies must be found that will not introduce further errors into this search for precision. The nature and degree of the basis for such an agreement will depend largely on the measure of maturity and common objectivity the union and management have attained in their working relationships.

A standard once established must not be subjected to bargaining or negotiating. A production goal might be established by bargaining but a standard — never. A standard for work required to perform an operation must be established as carefully and accurately as modern methods permit. It must never be subjected to influence of any sort that will distort it.

Budgets and Cost Controls

On the principle that there is but one standard regardless of its ultimate use, we find that standards for material usages, labor requirements, and spoilage stem from the same sources whether used in an incentive plan or a budget.

The natural evolution of an incentive installation is the development of various cost controls and measuring sticks. Although these are usually kept simple and few in number, nevertheless they do provide positive controls over labor and material usage. These incentive controls usually are available daily, that is, the results of yesterday's performance is

posted today. Thus the department head has the story of his group's performance from a labor standpoint, and often from a material usage standpoint as well, while it is fresh in his mind and of its greatest value to him.

Since budgets and other forms of cost control are designed for the same purpose, there is bound to be some overlapping and duplication unless this matter of control is viewed as an overall picture. In departments where an incentive installation has been made, the daily bonus report can also serve as the daily budget report. When the operators on incentive are earning bonus they should also be meeting or beating the labor budget. The budget allowances for those operations or classes of labor not on incentive and the results obtained can be incorporated on the same bonus report form, using a special column provided for that purpose. (See Figure 13.) Under such a set-up the preparation of the regular budget reports can be confined to weekly and monthly reports. Where the incentive installation is particularly complete and positive the formal budget report may be issued on a monthly basis only.

The important point in this matter of developing controls for the use and guidance of the department head is that we should bend every effort to keep them as simple and positive as we can. Thus the engineer in charge must consider and combine all sources of control data and information to gain that end. He should keep the controls which are set up flexible and properly maintained, so that he can always take full advantage of new developments that will improve the nature and effectiveness of those controls.

Employee Relations

The relationship between wage incentives and sound employee relations has been one of the most complex problems in the entire field of industrial relations.[1] The history of

[1] For a more complete study of this problem, see *Management, Labor, and Technological Change,* by John W. Riegel, University of Michigan Press, Ann Arbor, 1942.

this relationship is not one of which to be proud. In looking back over the past two or three decades this association has existed, let us profit by the mistakes made, and, with a minimum of indictments and denouncements, look to the future and build toward that sound relationship which can and must exist.

In considering this problem at this point in our discussion let us keep it free from the complications introduced by collective bargaining and all its ramifications. Let us consider it only from a human relations standpoint, which after all is the heart of the problem. Of all the factors that make the American workman stand out above all others, two are most prominent. They are his confidence in his ability to do a job, and his pride in his work and the place he works. Rob him of these and you have stolen his elements of greatness.

Therefore it is management's duty, privilege, and responsibility to see to it that nothing is permitted to enter the picture that will disturb their employees to the degree that their initiative and effectiveness are lost. If management does fail in this respect, our whole industrial system will suffer.

The Element of Fear in the Worker's Resistance to Wage Incentives. When we stop to analyze the single greatest element in the employee's resistance to wage incentives we find it to be *fear*. We find this fear taking many turns, all of them understandable and sometimes justified in view of past practices. All of them are surmountable and removable. All of them are unnecessary to the degree that their existence for any period of time represents a failure on the part of managment and others responsible for carrying on and interpreting the work of installing the wage incentive plan.

Analyzing this fear, we find that it is the unknown elements, the mystery that so often in the past surrounded this work, that is largely responsible for it. Workmen have a right to be and want to be "in the know" regarding anything that vitally affects them. Therefore it should be a fundamental policy that before *any* work is done, *the workers be fully informed of what is to be done, how it is to be done, and the*

goals sought. Furthermore, as each step is taken, it and its results should be fully discussed with them and the progress be made only as fast as the workers can absorb and assimilate it.

This fear and its accompanying resistance to incentives usually take the following patterns:

1. Their job will be de-emphasized to the degree that their skill and knowledge are no longer economic assets to them.
2. They will be required to work at a pace they cannot maintain without injury to their health, causing them to age prematurely.
3. There will be a reduction in the force, which will throw them out of work.
4. If they do not meet the standards every day they will either lose their jobs or be demoted.
5. The rate will be cut as production increases so that they will have to turn out more and more work for the same money.

In any given company or situation the degree and strength of these fears will depend largely upon the past experiences of the workers themselves in regard to incentives. They will also depend upon the experience and reputation of the use of incentives in other plants in the community. They will depend upon the harmonious relationships and the confidence existing between the employees and the management.

Where strong fixed emotional beliefs of an unfavorable nature exist, the introduction of an incentive program must be carefully managed or it will surely fail. This being so, it behooves management to see to it that all such projects are managed carefully and meet every test of fairness and equity with a maximum of protection for the workers involved.

The Fundamental Basis of Successful Wage Practice. Keeping in mind the fears listed previously, let us discuss the various steps that should be considered in approaching and solving this problem. There are four groups that will be responsible for the success or failure of the program. They are the general management, the foreman and his assistants, the engineers, and the hourly workers. Failure to

perform properly on the part of any one of the four will endanger, if not entirely wreck, the program. The attitude and degree of cooperation on the part of the hourly workers depend almost entirely on the soundness of the policies established by the general management, and the caliber and abilities of the supervisory staff and engineers. These are the key factors. Therefore let us first consider them and the parts they must play.

The General Management. Management must have its policies and thinking concerning this program and its results well in hand before the program is started. They must be prepared to express and discuss these policies with the employees in a clear concise manner before any actual work is done in the department or plant. These policies should include the following subjects (general examples are given for illustrative purposes):

1. The general objective of the study

To so simplify and organize the work in the department that waste will be eliminated to the degree that costs are lowered, the product improved, and the company's competitive position improved to the general good of all concerned.

To protect the jobs and earnings of all employees concerned to the maximum degree. To provide an opportunity through a sound incentive plan for the employees to increase their earnings over and above their base rates. To keep the employees fully informed at all times and to make them partners in the study to the maximum degree practicable.

2. Job security

No one will be laid off as a direct or indirect result of this study. Should anyone be released from his duties by the study, he will be given plantwide seniority and every effort made to re-establish him at his highest skills. Any excess labor remaining will be placed in a pool until such time as normal labor turnover reabsorbs them into regular jobs.

3. De-emphasis and dislocation of skills

De-emphasis of skills does not necessarily follow such installations. Just as frequently, a greater concentration of skill use results from proper organization of the work. Should the skill

requirements be lessened to a degree where the economic value of the job is materially lessened, then every effort will be made to transfer the workers to other equal skill jobs or to find other means of maintaining their take-home pay.

Where, through change in job content, skills are disrupted, formal programs to train the workers in the new methods will be established. Ample time will be allowed for this purpose, and earnings will be fully protected during the training period. Strong efforts will be made to keep assignments in line with each worker's capabilities and interests.

4. Establishment of work standards

All standards will be set in a fair and equitable manner. The output requirements will be established on the basis of what an average man suited for that type of work can or should produce.

Realizing that errors in judgment can be made, formal appeal channels to the foreman will be established. All appeals will be checked as soon as possible, with earnings being protected by making any changes retroactive to the time of the appeal.

Older or slower workers who cannot meet the minimum requirements of the job will be transferred to work more in keeping with their abilities.

5. Performance requirements against standards

Although consistent underproduction against standards proved in practice could not be permitted, nevertheless it is recognized that standards may not always be met. Variations in the output will be analyzed and efforts made to overcome controllable causes. When variations are a result of the worker's physical or emotional condition, his supervisor will work with him and suitable solutions will be reached.

6. Rate cutting

All standards will be set with care. No standard will be changed without good and sufficient cause. No standard will be changed without due notice to all concerned with full explanations of the reasons given.

Although other policies may be needed to fit a given situation, nevertheless these should be included in those thought through and prepared prior to any approach being made in the plant.

The Foreman. The foreman of the department must accept full and direct responsibility for the program. He

must believe in it, understand it, and become the driving force back of it. In doing so, he should in no way relinquish any of his prerogatives as foreman to the engineers during the study. The engineers, on the other hand, do not want to assume any of the foreman's responsibilities. They are there as technical assistants to him. They are staff men, and to accept or be given any line responsibility would only hinder them in their work. This is an obvious distinction but, because of past misunderstandings, it is well to repeat it here.

We are asking a lot of our foremen to accept this responsibility. In doing so we must recognize that with few exceptions management has failed to set up a formal program whereby their foremen could be trained to accept this responsibility in a creditable manner. Management has also come to realize more and more the type of individual required to make a successful foreman. They now recognize that he must be a leader of men, a manager, and that he must at least know how to use the simpler tools of management. In recognition of this, most managements have instituted comprehensive training programs to aid the foreman to become better qualified for his job.

We are now asking the foreman to assume the responsibility for this industrial engineering and incentive program. If he is to do this successfully he must be trained in at least the fundamentals of such work. He must have a sufficient grasp of what is involved in developing such a program so that he can not only make valuable suggestions to the engineers but can also readily answer the questions of his men. This latter point is of great importance. A workman naturally looks to his foreman for guidance and has confidence in him as his supervisor. If the workman knows that the foreman believes in this program, understands it, and is guiding and approving every step of it, then he knows that his interests are being protected. This relationship of confidence and understanding must be present, and no program should be started until it is present.

The Engineers. We have discussed previously the need for men of high caliber and good training to act as industrial engineers. It is every bit as important that these men be carefully selected and properly trained as it is that the foremen be fully qualified. These engineers must not only be sound from a technical standpoint but also from a human relations standpoint. They must be able to sell themselves and their work to everyone in the department. They must be able by repeated good performances to earn the respect and good will of the supervision and workmen. They must be able to establish a reputation for competence and fairness, and must have the friendliness that is absolutely necessary to the successful development of this work.

The Approach to the Hourly Employees. The matter of preparing examples and exhibits of techniques to be used, plans to be carried out, and results to be sought must be carefully planned, their purpose being to enable the supervision and engineers to illustrate their explanations and discussions of the program in their initial and subsequent meetings with the employees. These examples can take the form of charts, blown-up examples of forms, and film, both still and motion picture. Films depicting the conditions before and after a job has been analyzed have proved especially helpful in explaining the work of such a program and the results sought. Case histories of other installations, especially if from the same company or plant, are always helpful.

Thus armed and equipped, the foreman and the engineers are ready to hold their first meetings with the hourly employees. At this time full explanation is made of what is sought and how it will be accomplished. All matters of policy are discussed and explained. All questions raised are answered. If answers are not available, they should be obtained and given at the first opportunity. Similar meetings should be held as the study progresses and at the end of each phase of the program. It is particularly important that full explanations be given before any actual changes are made in the department.

While working in the department both the supervision and the engineers should be constantly on the alert to answer questions. They should encourage questions. Even when none are forthcoming they should talk things over with the workers involved to maintain the right relationship and to enlist their cooperation.

A practice to be recommended whenever it is practicable is the selecting of two or more key workers to work full time with the engineers during the entire project. These men are taught the various techniques used and are considered as regular staff members. Their intimate knowledge of the operations concerned is valuable, and they can be of real aid in getting the story of the study across to their fellow workers. It is a convincing move in view of the statement made that every step of the analysis and every result obtained are an open book to any worker who cares to study them or have them explained to him.

The day is not far distant when formal training programs designed to teach hourly key workers the fundamentals of industrial engineering will be common and accepted practice in industry generally. The possibilities of such a general move are staggering to the imagination of every practicing engineer. In his mind it will be a long, happy step forward on the path of industrial progress.

The Hourly Employee. The role the hourly employee must play, if such a program is to be successful, becomes apparent from the preceding discussion. In fact it is difficult to discuss effectively each group's part considered separately since the parts are so closely interwoven. The hourly employee must stand ready to accept his responsibility by being willing to become a partner in a sound program. He must stand ready to aid in every way that he can to make the results of the study as conclusive as possible and then aid in the successful installation of the conclusions.

We cannot close a discussion of this problem without mentioning proper employee selection and training. If the company has a sound and complete program to select properly

and place new employees in jobs for which they are best fitted, it has taken a long step toward good employee relations. If a worker is on a job for which he is not fitted, for any reason, he is aware of that fact before anyone else. The longer he is on the wrong job, the stronger will be his defense mechanism to oppose any move that might reflect against him. Accordingly such a worker has a real basis to fear such a program as we have been discussing. It is from such misplaced individuals that the strongest oppositions spring. We have discussed the problem of transferring such workers to jobs for which they are more fitted. Our goal should be to see to it that they are properly placed when they are hired.

The same thinking holds true for training. Even if on poorly organized work, each employee should be trained to do the job in the best manner that has been established. It helps his morale and aids in determining his fitness and aptitude for that type of work. On work that has been organized and measured, proper training is a requirement for all new employees before they are put to work as regular employees. Thus their ability to perform the job is proved before they take their places in the production line.

Chapter III

FIVE FUNDAMENTAL TYPES OF WAGE INCENTIVE PLANS

There are many different types of wage incentive plans in use today. When incentive plans first broke away from piece work systems there were many different types developed. In the light of the limited industrial engineering knowledge and practices of that time, attempts were made to control the many variables encountered through the type of plan. That meant that most of them were complex and difficult to understand and operate.

In recent years as industrial engineering practices became more complete, the trend has been away from the complex plans and toward the simpler, more understandable ones. This trend was brought about by two forces: one, the elimination of many variables and the establishment of controls over the remainder through careful analyses and studies, and, two, the desire to make the incentive plan understandable and therefore more acceptable to the employees. This trend is a laudable one and should be fostered. No incentive plan should be more complex than is necessary to include the factors that represent the production goals sought. These factors include increased production, material control, spoilage reduction, equipment utilization, and the like.

To include a description of even a majority of the incentive plans now in use would unnecessarily complicate our discussion. As stated, many plans once popular are now fading from the industrial scene and therefore are losing their importance. That being so, let us then confine our discussion to the five types of plans which probably, at least in their fundamentals, represent the vast majority of incentive plans now in force. They are:

1. Straight Piece Work.
2. The Hour-for-Hour or 100 Per Cent Bonus Plan.
3. The 50-50 Premium Bonus Plan (Halsey).
4. Point Plans Typified by the Bedaux System.
5. Measured Day Work.

There are variations of each of these plans from the description we shall give. However, the variations usually represent personal ideas and are within the fundamental structure of the plans. Therefore, again for the sake of simplicity of discussion, we will confine our consideration of these variations only to the more common ones.

1. Straight Piece Work

This plan is more generally used than perhaps any other. Its chief characteristic is that all standards are expressed in terms of so much money for a given unit of production. The time standards developed by time studies are converted into money by applying the time allowed to perform the job against the base rate for that job. The plan is easily understood by the workmen.

Since this is a Straight Piece Work Plan the employee gets all that he earns. There are variations of this principle in the form of differential piece rates usually designed to encourage high productivity, but they do not commonly exist because of their complexity. This plan also provides for a constant unit cost once production exceeds the amount required to earn the guaranteed hourly base rate. This is advantageous from both a cost accounting and a budget standpoint.

Piece work has several disadvantages which are important and should be borne in mind when discussing it. One is that it links the time study function irrevocably with the amount of money earned. This fact is not in keeping with the principle of disassociating the establishing of standards in the worker's mind from the amount of money he is paid to perform his job. It makes it very difficult for the engineer to convince the employee that he is not interested in how much money the employee is paid to do a job but only in measuring as accurately as he can the amount of work in the job. The amount of money paid for doing the job is determined by job evaluation and the resultant establishment of a base rate structure, not by time study.

Another disadvantage is the vast amount of clerical work involved in changing all piece rates when the general wage scale is

changed. Not only is this a big job from the standpoint of the number of rates to be changed, but the care required to prevent errors in calculating the new rates is a large factor. Then, too, the confusion that the new rates often cause in the minds of many workmen is time consuming for both the supervision and the engineers.

Piece rates do not lend themselves readily to group incentives where workmen with more than one base rate are involved. Under such a condition it is usually necessary to convert the total piece rate into percentages of the total that will be paid to each man, or to break the total rate down into its component parts. Piece rates are also more difficult to handle than time rates when there are such positive factors in the incentive as control of materials and the like. Under certain conditions control of material usage carries a greater weight than production. It is here that piece rates are awkward in their application.

Another very definite disadvantage is the fact that piece rates are strongly and deeply associated with past bad practices in the use of incentives. These past bad practices are the establishment of standards based on the foreman's estimate and rate cutting. Therefore labor, from bitter experience, feels that it has reason to be suspicious of the Piece Work System of wage payment. In line with this fear of rate cutting the engineer who has to work with a Piece Work System finds it most difficult to adjust rates when there has been a change in the requirements of the job because of improved methods or the like. The standard is buried in the money rate and, when changed downward, is more likely to be construed as a cut in the rate than if the standard were expressed in terms of time rather than money.

Although this plan is in greater use than any other, it is largely because it is the oldest type of wage incentive plan in use and was widely known before the other plans were developed. However, in my opinion, it is outmoded for the reasons given above and its use is diminishing.

2. Hour-for-Hour or 100 Per Cent Bonus Plan

This plan began to achieve prominence when the estimating of production standards became more of an engineering function and less a matter of guessing. Standards began to be based on carefully made and analyzed time studies rather than on past averages and foreman's estimates.

The main feature of the plan is that the workers receive 100 per cent of the bonus earned. In this way it compares with Straight Piece Work. In fact the only major difference between

Straight Piece Work and the Hour-for-Hour Plan is that, under this latter plan, the standards are expressed in time per unit of production rather than in money. In view of this fact the plan has none of the disadvantages of money rates and yet has all the advantages of Straight Piece Work. Men who are used to figuring their rates in terms of money can easily make the transition to terms of time.

Although the standard is always expressed in terms of time, the earnings can be calculated either in terms of time saved or as a per cent efficiency. For example, when time saved is to be the basis, a standard is developed in the following manner. Suppose that in the best judgment of the time study analyst a normal man, who is skilled in the work, physically and mentally suited for it, and working at a pace he can maintain day in and day out without injury to his health, can do the job in one minute. This normal man may in no sense be the average of the group or any individual in it, as they or he may not meet these requirements. Then, if it is the policy of the company to pay 25 per cent bonus to the workman who does the job in one minute, the time allowed would be 1.25 minutes. In other words, although the workman takes only one minute to do the work, he would be paid 1.25 minutes for it. It could be said further that, should he take 1.25 minutes, he would be breaking even from an incentive viewpoint. At that rate of output he would then be considered to be earning his base rate and be qualified for the job.

If, on the other hand, it was felt desirable to use an efficiency basis for the purpose of designating performance to determine the percentage of bonus earned, then the one minute standard expectancy for a normal man would become 100 per cent efficiency. The 1.25 minute break-even point would become 80 per cent efficiency. Then for every per cent of improvement in efficiency the worker would receive 1.25 per cent bonus. The percentage of efficiency is obtained by dividing actual hours into normal standard hours, in this case one minute equals 100 per cent efficiency.

For ease of understanding it is my opinion that expressing the standard in total time allowed, as described in the first example of calculation, is to be desired above the efficiency method. It is more easily understood by the employees and thus it is simpler for them to calculate their bonus earnings. It has a further advantage in that the standard is given them in total time allowed, that is, the break-even point. They can then readily see that they are earning a bonus as they start to take less time than they are allowed by the standard. For ease of bonus calcu-

lations some engineers prefer to express the standard in decimal hours rather than in minutes. However, again, from the viewpoint of ease of understanding on the part of the workmen, minutes are preferable. It is a simple calculation for the payroll department to translate these into hours for their purposes.

The plan lends itself readily to the development of controls and efficiency measuring sticks. Since it provides for a constant unit cost once the break-even or 0 per cent bonus point is reached, it is desirable from a cost accounting and budget standpoint. In my opinion, this plan is the most desirable of those we are discussing. In my experience I have never found a situation wherein its fundamental principles would not apply equitably.

3. The 50-50 Premium Bonus Plan (Halsey)

This plan was developed by F. A. Halsey, who was either the first, or one of the first, to develop a modern type of incentive plan that broke from Straight Piece Work. This plan was also one of the first to use a guaranteed base rate and to express standards in terms of time rather than money.

Since his standard times were usually set from past production records, he chose to divide the production time saved under these standards equally between the employee and the employer. Thus the plan became known as the 50-50 or Split Bonus Plan. Under modern practices, this basis of setting standards is not acceptable, and our opinion is supported by experience. It leads to uneven requirements between jobs with resultant wide swings in earnings. Incidentally, the primary reason for splitting the time saved was that it tended to compensate for these wide swings.

The standard was developed by adding double the desired bonus to the estimated minimum time it was thought the operation required and then giving the employee half the bonus he earned. For example, if as in the explanation used in the Hour-for-Hour Plan discussion, the expected performance time was one minute, then under the 50-50 Plan the standard would be 1.5 minutes rather than 1.25 minutes. On an efficiency basis the break-even point would be 66.6 per cent efficiency as against 80 per cent for the Hour-for-Hour Plan. Then each per cent improvement in efficiency would reward the worker 0.625 per cent bonus.

This feature of adding double the desired bonus and then giving the employee half of what he earned enabled the employee to earn some bonus at a relatively low efficiency performance, thus protecting him somewhat against standards that were estimated too low. Conversely, it protected the company against

excessive bonus earnings in the event that the standards were set so high that the increasingly diminishing returns to the worker do not encourage him to extend himself above a certain point, that point being the one at which he earns the expected per cent bonus, in this case 25 per cent. (See Figure 1.) Another feature of this plan is that it provides a varying unit labor cost at all points, which is not desirable from a budget and cost viewpoint.

With the advent of modern techniques and practices in time and motion study it is difficult to justify the use of a split plan such as this. It is hard to deny the advantages of starting the payment of bonus at a low percentage of efficiency from an employee acceptance viewpoint; nevertheless, if the basis of the plan is sound, then the use of such a device to gain acceptancy should not be required. This advantage is more than offset by the discouragement offered the worker to extend himself above the expected bonus earnings. Thus it encourages a ceiling on earnings well below the abilities of some of the workmen.

If the proponents of this plan are completely sincere in their justification of its use on the basis of its enabling the worker to earn bonus at a low percentage of efficiency, they could improve the reception of their stand by adopting the Hour-for-Hour principle above the expected bonus earning point or 25 per cent. (See Figure 1.) On this basis they could retain their objective of offering greater encouragement to the worker at low performance and obtain the desirable feature of providing maximum encouragement to the above-average worker by offering him 100 per cent of the bonus he would earn above the expected earnings point of 25 per cent.

Those who oppose the continued use of the 50-50 Plan today contend that it encourages inaccuracy in the establishment of standards, and is still used as a device to alleviate the degree of seriousness of those inaccurate standards. Another factor in this opposition is that, since bonus is paid at low efficiencies, unit labor costs may be increased at those levels, which is undesirable from a cost standpoint.

4. Point plans typified by the Bedaux System

This plan and its contemporaries were very popular with management during the 1920's. They emphasized the development of controls or efficiency measuring sticks as a major part of incentive plans. The introduction of cost controls as a feature of incentive plans was a major step forward in increasing their value and general usefulness to management. These plans also included other incidental features which were intended as refinements in the establishment of incentive systems.

For example, in the earlier days Bedaux engineers used as the unit for expressing their standards the letter B. One B was equal to one minute. Today this term B has been generally discontinued and either straight time — usually minutes — is used or some coined term such as " units." In its earlier applications, the worker was paid 75 per cent of the bonus earned, the other 25 per cent going into a pool, out of which a supervisor's bonus was paid. This practice has been almost entirely discontinued, and today the worker is paid 100 per cent of the bonus he earns.

Another feature of the plan was the establishing of 60 B's, units, or minutes per hour as an average worker's output and 80 B's, units, or minutes per hour as a normal worker's output. In other words, in comparison with the 25 per cent we have been using in our example, they expected to pay 33⅓ per cent for the same performance when the worker was given all the bonus earned. The comparable standard would be 1.25 minutes and 1.33 minutes with the normal worker performing the job in one minute in both instances and in one case receiving 25 per cent bonus and in the other 33⅓ per cent bonus.

5. Measured Day Work

This type of incentive plan is of recent origin. It came into some measure of popularity in the early 1930's, when there was a strong wave of opposition to incentive plans as such on the part of labor unions.

There are a number of variations of the plan in effect but they generally follow a common pattern. Standards are established just as they would be for any incentive plan. The application, however, takes a new form. This form is that first the base rate for the job is established in accordance with rate structure principles. Then higher hourly rates are set at various levels of efficiency, usually on a direct proportion or 100 per cent basis. The worker's performance against standard is translated into terms of efficiency each day and posted in the shop.

When he achieves a certain average efficiency for a stated period, usually three months, his base rate is increased accordingly, and is in effect for the next three months. Then the efficiency he achieves for that next three months is the basis for the next period's hourly rate. For example, let us assume that the rate structure base rate for a job is 80 cents. Under Measured Day Work we shall estimate that if a worker averages 80 per cent efficiency he earns the base rate of 80 cents. Then we would set up a scale of, say, 85 per cent efficiency equals 85 cents an hour; 90 per cent efficiency equals 90 cents an hour; 95 per cent efficiency

equals 95 cents per hour; 100 per cent efficiency equals one dollar an hour; and so on.

A worker A, when the plan is first placed in effect, has an efficiency of 80 per cent for a base rate for the first period of three months, or 80 cents. Then if during that three-month period he achieved an average of 90 per cent efficiency, his rate of pay for the next three months would be 90 cents per hour. If during that second three-month period his efficiency dropped to 85 per cent, his rate of pay should be reduced to 85 cents an hour for the following or third period.

It was the application of this descending feature of the plan that caused most trouble and was largely responsible for the elimination of the incentive feature of the plan. In other words, it worked reasonably well as long as the worker's efficiency remained static or on the ascendency. When his efficiency started to descend because of poorer performance, arguments and disagreements arose when the rates were reduced accordingly. This reception of the unfavorable feature proved so upsetting that the plan, as a true incentive plan, fell into disfavor. Yet if the descending factor was not kept in full force along with the ascending, the plan degenerated into a device to increase wages more or less permanently without the required sustained output to justify it.

It is obvious that, under a plan of this sort, a very heavy burden is placed on the supervision if the level of output is to remain satisfactory. This is due to the fact that the incentive factor has been dulled by the long period application to the point that the worker is inclined to acquire a reasonably high efficiency rate for a period and then coast on the strength of it. Thus it falls to the lot of the supervisor to attempt to encourage him to maintain his output level with only a negative incentive — that of a lower rate in the future — to aid him.

In those plants I know, where this plan is in effect, the incentive feature has been discontinued. However, the control feature has been kept in full as a measuring stick and aid to the supervision in their effort to improve the efficiency of the individual worker and the department as a whole. Although this is difficult to do without a financial incentive, under this plan that feature is so weak it is of little help. As a control mechanism it is highly desirable. As an incentive plan, in my opinion, it has been found wanting.

The area of its most likely use would be an industry where a conveyor or other automatic equipment controls production. Also it has been used in situations where an extreme hazard exists

insofar as quality is concerned, requiring unusual care on the part of the operator. However even here I do not believe that it is as effective as some other plan, such as the Hour-for-Hour. As indicated before, the length of the stated period may vary, one month usually being the minimum period and three months the maximum period – and probably the most commonly used.

If for any reason it was deemed undesirable to place an incentive plan in effect, I would recommend the application of Measured Day Work as a control device. The same end could also be achieved by eliminating the incentive feature and retaining the control feature of the other plans we have discussed.

Chapter IV

ELEVEN BASIC REQUIREMENTS OF A SOUND INCENTIVE PLAN

Before making any further comparisons of the five plans we have discussed, it is desirable that we consider what are the eleven basic requirements of a sound wage incentive plan. There are other features and requirements, but at least these eleven should be considered and used as measuring sticks of the desirability and completeness of any incentive plan.

1. The plan should reward the employee in direct proportion to the increased output

Justly or unjustly the worker does not like to share the direct result of his greater output. The worker feels that fair standards should be established and, once he meets and exceeds those standards, he should receive the full benefits therefrom. Thus any part payment plan is faulty in this aspect.

This is a logical conclusion not only from the viewpoint of the worker but also of the management. It presupposes that the plan is on a sound and equitable basis. Therefore the worker is entitled to the full gain from exceeding standards, and management should provide maximum encouragement for him to exceed them.

2. The plan should be understandable and easily calculable by the employees

It is necessary that the worker be able not only to determine his earnings from the percentages furnished him but also to understand how the percentages are determined. Any plan that is not understood or easily figured by the worker is looked upon with disfavor and distrust. Any plan, no matter how complex or how simple, that is designed to limit earnings will finally be detected with most unfavorable results. The savings effected through the employees meeting the standards, thus increasing production or maintaining it, plus the natural result of lower overhead, should be ample remuneration for any employer.

3. Hourly base rates should be guaranteed

Under any plan the worker should be guaranteed his base rate so that he knows that no matter what happens the least he can

earn for any hour spent in the plant is his guaranteed base rate. This base rate is the one established by rate structure and not an arbitrarily chosen lower rate. There should be one base rate for a job regardless of whether or not it is on incentive. This eliminates the uncertainty and insecurity of earnings that once accompanied most incentive plans and made the worker reluctant to accept them.

4. There should be enough spread between the guaranteed base rate and the normal bonus rate to provide incentive to extra effort or sustained effort

This can be too large as well as too small. When too small the incentive to produce is lacking. When too large it may be ineffective because the reward for increased output starts before the increased output is discernible, resulting in higher unit labor costs. What this spread should be is largely a matter of opinion. I would recommend that it be 25 per cent, with 20 per cent a minimum acceptable spread and 30 per cent the maximum desirable spread.

5. It should provide enough of a guarantee of standards to give the worker a feeling of security

The standard must be guaranteed against any change except when there has been a definite change in methods, tools, equipment, specifications, or materials which affect the rate of production. This guarantee must be meaningful and strictly adhered to. The standard should never be changed merely because some exceptional worker is earning a seemingly excessive bonus. There are exceptional workers, and they must always be recognized as such.

6. Definite instructions covering policy and methods should be provided

Management must unfailingly define and establish the policy as to what it will and will not do and what employees may and may not do. A weak vacillating policy or group of policies can do irreparable damage in all phases of wage administration. In all cases where the line is not clean cut as to what is fair, rule in favor of the worker.

7. Shop procedure should be standardized

This includes material and equipment requirements, clean-cut specifications, production control, and standard operating instructions in addition to the other phases of good shop control.

8. Measured standards must be based on definite quality requirements with proper and direct controls placed over waste

This is an essential factor in the development of any standard and must be clearly and specifically set forth with definite methods of measurement given.

9. Equitable adjustment for failure to meet the task when the cause of the failure is beyond the employee's control should be provided

By placing the responsibility for each failure where it belongs, management not only indicates its fairness to labor but also focuses attention on organizational weaknesses and insures institution of corrective measures.

10. Once production is such that bonus is earned, unit costs should be constant

This is desirable from a cost and budget standpoint as well as being indicative of the fact that the employee is receiving the full benefit of his greater output.

11. To be effective the plan must be rigidly maintained

The most essential practice in the operation of any incentive plan is its maintenance. Is there anything more important to any worker than his wages? Of course he is interested in better working conditions and special privileges, but above everything else he is interested in the pay he receives for his efforts and the fairness with which this amount is determined.

Chapter V

COMPARISON OF INCENTIVE PLANS

In making our comparison of these various plans, it would probably be simpler if we compared each one with the Hour-for-Hour or 100 Per Cent Bonus Plan. This basic plan, I feel, is the most desirable one we shall discuss. It is also the most desirable one with which I am familiar.

Comparison between Piece Work and the Hour-for-Hour Plan

Since the only fundamental difference between Straight Piece Work and the Hour-for-Hour or 100 Per Cent Bonus Plan is the fact that under Piece Work the standards are expressed in terms of money and under the Hour-for-Hour Plan they are expressed in terms of time, we shall confine our comparison to their relative simplicity and acceptability.

1. The Piece Work Plan links the time study function directly and completely with money, which is undesirable from an employee acceptance standpoint.
2. In the event of blanket wage changes, the problem of changing all the piece rates in effect is large and costly from a clerical standpoint.
3. Piece rates and bad wage practices are synonymous in the minds of many workers and union leaders. Therefore they do not readily accept the Piece Work Plan.
4. The only advantage which the Piece Work Plan can possibly have over the Hour-for-Hour Plan is that money rates may be more easily understood than time rates. This advantage, if it exists at all, is slight.

Comparison between the 50-50 Premium Bonus Plan and the Hour-for-Hour Plan

Both plans call for a guaranteed base rate equal to the day work rate for that job. Both plans can provide for earning

the same percentage of bonus, in this case 25 per cent for normal output. There is, however, a distinct difference in

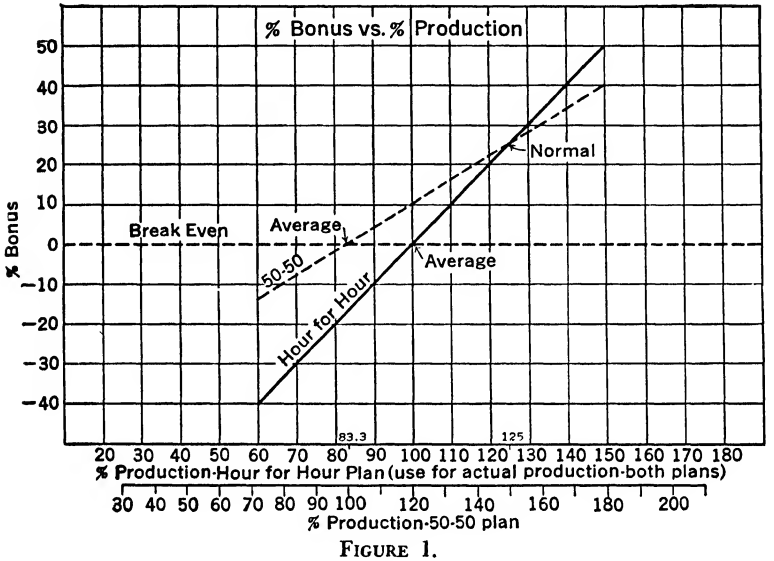

FIGURE 1.

TABLE I

DATA FOR FIGURE 1

% Bonus vs. % Production

% Bonus		% Production	
Hour-for-Hour Unit-Actual Actual	50–50 Unit-Actual (½) Actual	Hour-for-Hour Unit Actual	50–50 Unit Actual
−40	−14	60	72
−30	− 8	70	84
−20	− 2	80	96
−16.7	0	83.3	100
−10	4	90	108
− 0	10	100	120
10	16	110	132
20	22	120	144
25	25.0	125	150.0
30	28	130	156
50	40	150	180

the production point at which the bonus starts to be earned. The only production point at which the same percentage of

bonus is earned under both plans is at the normal or 25 per cent point. See Figure 1 and its accompanying table for a further illustration of this point.

As can be noted in Figure 1, at the break even or 0 per cent bonus point on the 50-50 Plan, the same production calls for −16.7 per cent bonus on the Hour-for-Hour Plan. On the other hand, production at the 0 per cent bonus point on the Hour-for-Hour Plan calls for the payment of 10 per cent bonus on the 50-50 Plan. This illustrates clearly the fact that the 50-50 Plan calls for starting to pay bonus at a lower production rate than does the Hour-for-Hour Plan. Although this feature does offer encouragement to the worker by paying bonus for a relatively low rate of output and has some value from an acceptability standpoint, at the same time it does favor the substandard worker, which is not desirable. Although both plans pay 25 per cent bonus at the normal or expected production point, it should be noted that the rate of production which calls for paying 30 per cent bonus under the Hour-for-Hour Plan calls for paying only 28 per cent under the 50-50 Plan. Thus it is said that the 50-50 Plan penalizes the above-normal worker, which is most undesirable from any standpoint.

The variation in unit labor costs between the two plans is reflected in Figure 2 and its accompanying table. Under the Hour-for-Hour Plan the unit cost is variable up to the 0 per cent bonus point and is fixed from there on. Under the 50-50 Plan the unit cost is variable at all times because of the split bonus feature. As can be further noted, the unit costs under the two plans are the same up to 100 per cent production on the 50-50 Plan and its equivalent 83.3 per cent production on the Hour-for-Hour Plan. From that point on, the unit cost for the same production is higher under the 50-50 Plan up to the 25 per cent bonus point on both plans where both plans are equal. From the 25 per cent bonus point on, the unit cost is lower under the 50-50 Plan. However, the same feature that makes this possible also tends to discourage increasing production beyond the 25 per cent

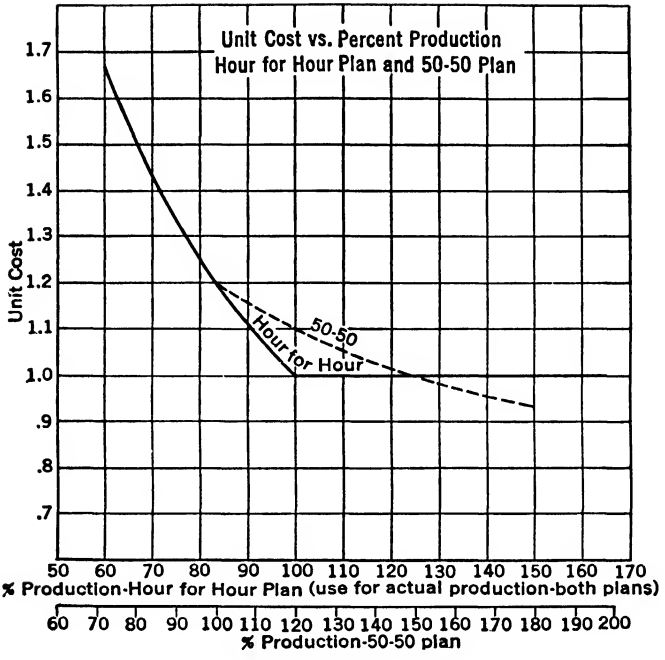

FIGURE 2.

TABLE II

DATA FOR FIGURE 2

Unit Cost vs. % Production

$$\% \text{ Actual Unit Cost} = \frac{\% \text{ Earnings}}{\% \text{ Production}}$$

Hour-for-Hour Plan			50-50 Plan		
% * Production	% † Earnings	Actual Unit Cost	% * Production	% † Earnings	Actual Unit Cost
60.0	100	1.667	60.0	100	1.667
70.0	100	1.429	70.0	100	1.429
80.0	100	1.250	80.0	100	1.250
83.3	100	1.200	83.3	100	1.200
90.0	100	1.111	90.0	104	1.156
100.0	100	1.000	100.0	110	1.100
110.0	110	1.000	110.0	116	1.056
120.0	120	1.000	120.0	122	1.017
125.0	125	1.000	125.0	125	1.000
130.0	130	1.000	130.0	128	0.985
150.0	150	1.000	150.0	140	0.933

* For % production on both scales assume 100% as break even on Hour-for-Hour Plan.

† A guaranteed base rate equal to 100% earnings is assumed.

bonus point because of the ever-increasing effect of the diminishing returns to the worker as production is increased.

Comparison between the Bedaux Premium Point Plan and the Hour-for-Hour Plan

The Bedaux Plan is also based on a guaranteed base rate equal to the day work rate established for that job. Both plans pay 100 per cent of the bonus earned to the worker. Under the Bedaux Plan, however, a higher per cent bonus is paid for the same production, as ordinarily it calls for paying 33⅓ per cent bonus at normal output compared with the 25 per cent bonus called for by the Hour-for-Hour Plan.

The variation in the per cent of bonus earned is reflected in Figure 3 and its supporting table. This figure shows that the break-even point for the Bedaux Plan is equal to −6.0 per cent on the Hour-for-Hour Plan. Reading further, we find that at the 13.6 per cent point on the Hour-for-Hour Plan 21.2 per cent bonus is paid under the Bedaux Plan. As stated earlier, the 25 per cent point on the Hour-for-Hour Plan calls for the payment of 33⅓ per cent bonus under the Bedaux Plan.

The variation in unit labor cost is reflected in Figure 4 and its supporting table. Here it is shown that the unit costs are equal up to the break-even point on the Bedaux Plan, which is 93.8 per cent on the Hour-for-Hour Plan. Although both plans have a constant unit cost once they reach their own break-even point, the break-even or 100 per cent point on the Hour-for-Hour Plan is equal to 106.6 per cent on the Bedaux Plan. From that point on, the spread between the two plans is constant.

Summary of Comparisons of Plans

In summarizing the comparisons of the three plans we have discussed, we might consider the various points brought out in the light of the eleven basic requirements given in Chapter IV.

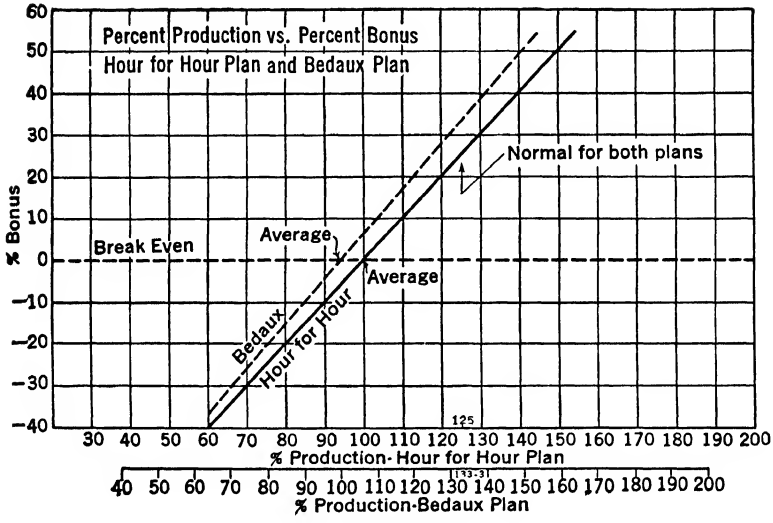

FIGURE 3.

TABLE III

DATA FOR FIGURE 3

% Bonus vs. % Production

Actual Time	Per Cent Production		Per Cent Bonus	
	Hour-for-Hour	Bedaux*	Hour-for-Hour	Bedaux*
2.0	62.5	66.7	−37.5	−33.3
1.9	65.8	70.2	−34.2	−29.8
1.8	69.4	74.1	−30.6	−25.9
1.7	73.5	78.4	−26.5	−21.6
1.6	78.1	83.3	−21.9	−16.7
1.5	83.3	88.9	−16.7	−11.1
1.4	89.3	95.2	−10.7	− 4.8
1.333	94.0	100.0	− 6.0	0.0
1.3	96.2	102.5	− 3.8	2.5
1.25	100.0	106.6	0.0	6.6
1.2	104.2	111.1	4.2	11.1
1.1	113.6	121.2	13.6	21.2
1.0	125.0	133.3	25.0	33.3
0.9	139.0	148.1	39.0	48.1
0.8	156.3	166.7	56.3	66.7

* Bedaux 100% Plan.

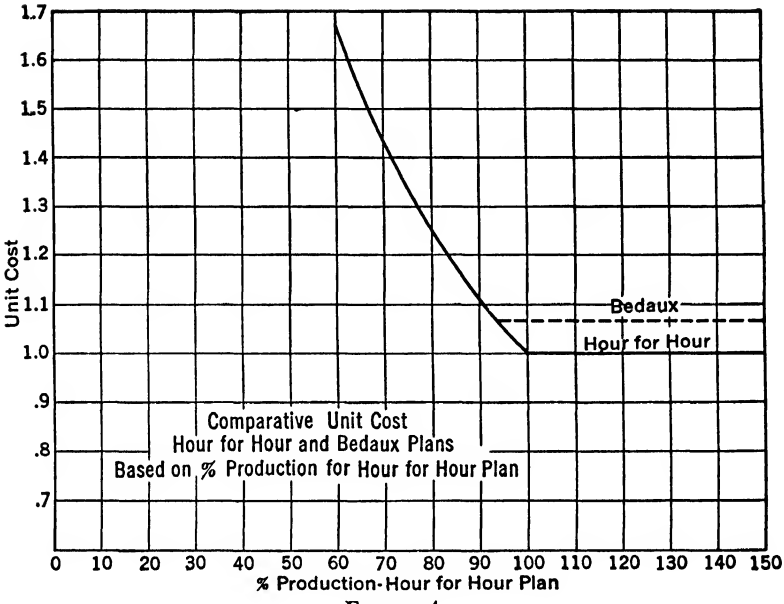

FIGURE 4.

TABLE IV

DATA FOR FIGURE 4

Per Cent Production	Per Cent Earnings		Actual Unit Cost	
	Hour-for-Hour	Bedaux 100% Plan	Hour-for-Hour	Bedaux 100% Plan
60.0	100.0	100.0	166.7	166.7
65.0	100.0	100.0	153.8	153.8
70.0	100.0	100.0	142.9	142.9
75.0	100.0	100.0	133.3	133.3
80.0	100.0	100.0	125.0	125.0
85.0	100.0	100.0	117.7	117.7
90.0	100.0	100.0	111.1	111.1
93.8	100.0	100.0	106.6	106.6
100.0	100.0	106.6	100.0	106.6
110.0	110.0	117.3	100.0	106.6
120.0	120.0	127.9	100.0	106.6
125.0	125.0	133.3	100.0	106.6
133.3	133.3	142.1	100.0	106.6
150.0	150.0	159.9	100.0	106.6

1. The plan should reward the employee in direct proportion to the increased output

Both the Hour-for-Hour and Bedaux Plans meet this requirement. The 50-50 or Halsey Split Plan does not as it calls for sharing the results of the increased output.

2. The plan should be understandable and easily calculable by the employees

The Hour-for-Hour Plan is the most easily understood since its standards are expressed in minutes. The Bedaux Plan is next in this respect and, if it should also express its standards in minutes, would be as easily understood as the Hour-for-Hour Plan. The 50-50 Plan is the most difficult to understand because of its split feature, which requires sharing the bonus earned.

3. Hourly base rates should be guaranteed

All three plans meet this requirement in modern practice.

4. There should be enough spread between the guaranteed base rate and the normal bonus rate to provide incentive to extra effort or sustained effort

Although both the Hour-for-Hour Plan and the 50-50 Plan call for paying 25 per cent bonus at normal, the 50-50 Plan does not fully meet this requirement above that point because of its increasingly diminishing returns.

The Bedaux Plan, when based on paying 33⅓ per cent bonus at normal, more than meets this requirement. In my opinion, however, the additional good results gained by paying this higher per cent bonus do not justify paying more than the 25 per cent bonus recommended.

5. It should provide enough of a guarantee of standards to give the worker a feeling of security

All three plans can and should meet this requirement.

6. Definite instructions covering policy and methods should be provided

Here again all three plans can and should meet this specification.

7. Shop procedure should be standardized

This is a fundamental principle that can be incorporated in the basis of all three plans.

8. Measured standards must be based on definite quality requirements with proper and direct controls placed over waste

Keeping in mind modern applications of all three plans, we see that they can be equal in this respect.

9. Equitable adjustment for failure to meet the task when the cause of the failure is beyond the employee's control should be provided

This is in reality a management policy requirement that can and should be a feature of any incentive plan.

10. Once production is such that bonus is earned, unit costs should be constant

Both the Hour-for-Hour and Bedaux Plans meet this requirement and the 50-50 Plan does not.

11. To be effective the plan must be rigidly maintained.

This is another fundamental management policy that can be applied equally to all three plans.

As I stated earlier, I believe that the Hour-for-Hour Plan is the most generally satisfactory of these three plans or of any other plan with which I am acquainted.

The Bedaux Plan, or a similar plan, is next in desirability, in my opinion. I think that the 33⅓ per cent bonus at normal is unnecessarily high. However, that is not a required feature of the plan, as the per cent chosen is a matter of company policy. The Bedaux and other comparable plans popular in the 1920's fell into disfavor with organized labor primarily because of the lack of understanding, prevalent at that time, of the effort required to simplify, standardize, and organize work before it is placed on incentive. These plans also suffered from lack of sound policies governing them as well as a sound concept of the proper use of incentive plans. They have become more acceptable to labor in recent years; nevertheless, their acceptability is still lower than that of others not similarly spot-lighted.

The 50-50 Plan is the least desirable of the three and, in my opinion, should not be used. It is outmoded. The reasons for its split feature should no longer exist in modern practice, and its sharing principle is not acceptable to labor.

Chapter VI

POLICIES GOVERNING WAGE INCENTIVE PAYMENTS TO INSURE THEIR FAIR AND EQUITABLE ADMINISTRATION

In preparing and stating the general company policies that will govern incentive payments and the development of the bases for these payments, it is desirable to divide the policies into two parts. The first part deals with those general fundamental policies that state the bases for incentive work in the company. The second part deals with those general policies which govern the actual payment of incentive moneys and the control of those payments.

The following group of policies, given in outline form as they might appear in an installation manual, are designed to indicate the scope these policies should take and the form they might have. As recommended, they are broken down into two groups. Policies such as these should become an integral part of every operating manual governing a wage incentive installation. Copies of any changes made in any published policy should be made immediately available through the supervision to the employees affected.

I. General Basis of Incentive Plans

A. Type of incentive

In the majority of conditions, individual incentive, when practicable to install, seems to be the most satisfactory and productive type of incentive. When it is necessary to deviate from this general policy, however, an attempt should be made to keep any group or gang set-ups as small in number of members as practicable.

B. Coverage

All incentive installations should cover the entire work of the department as completely as seems practicable. This includes giving consideration and proper emphasis to such factors as

quality, waste, spoilage, expenses, supervision, indirect labor, and excess costs of operation in addition to direct labor.

It shall not be policy to place individuals on incentive whose production cannot be measured economically and controlled by direct standards either as an individual or as a member of a group.

C. Basis of incentive plan

The general policy of the company is that the Hour-for-Hour or the 100 Per Cent Full-Share Bonus Plan shall be standard throughout the company.

Bonus is on an accumulative basis for a full shift, bonus hours earned each day being added to the previous total of bonus hours earned. In the event that the standards have not been met for a shift, no penalty will be inflicted. All participants begin each new work day or shift with a clean record.

D. Basis of standards

1. Time Studies and Standard Data. A sufficient number of time studies must be taken to set equitable standards. This, however, does not preclude the use of formulized data established in accordance with standard company practices.

2. Percentage Bonus Allowance. The general policy of the company is that the standards shall be set in such a manner that it will be possible to earn 25 per cent bonus for a normal output above the break-even or average measured output established for a job. It is not the desire or intent of the company to limit bonus earnings to 25 per cent but to pay in the same full proportion for any output above normal.

3. Personal, Fatigue, and Delay Allowances. Personal, fatigue, and delay allowances are made for each operation, depending upon its characteristics. These allowances must be kept uniform between plants and departments for like operations.

E. Keyman or supervision incentives

Keyman or supervision incentives will be formulated when sufficient incentive coverage of a department has been obtained and proper consideration of all contributing factors has been given to warrant placing the supervisors on incentive.

F. Uses of incentive plan

The construction of the plan is such that it serves not only as a method for the payment of bonus and a measure of the effectiveness of an operation, but also as a basis for comparison of the effectiveness within and between departments. It

further encourages the development of skills and the adoption of the best-known methods of performing work.

G. Explanation to employees

It is the policy of the company to explain fully the fundamentals of the incentive plan to all the workers affected by it at group meetings just prior to the installation of a new or revised plan. When these meetings are held it will be necessary to explain how the standard is developed and how the bonus is computed so that each worker will understand how to compute his own bonus earnings. It is advisable, and in line with company policy, to review fully with the worker any and all data used in establishing standards.

H. Analysis of operations to be placed on incentive

Before establishing work methods and standards, a thorough analysis should be made to improve methods and equipment, eliminate unnecessary elements of work, reduce fatigue, improve working conditions, and assure a minimum of wasted material. Where necessary, adequate relief, or shifting between jobs, should be recommended for fatiguing incentive jobs.

I. Method of checking effectiveness of plan

To determine the general effectiveness of the plan and the analysis preceding its installation, an average preinstallation period is selected by the supervision and the industrial engineering department in order to learn the degree of increase in employee earnings and the reduction of cost.

This period serves as a base period or standard measuring period of employee earnings and labor and material costs, against which current earnings, labor, and material costs are compared.

J. Review of incentive plan before installation

Before an incentive plan is installed or any major changes made in an installation in effect, the department head involved and the chief industrial engineer will review the changes in detail with the plant manager and personnel manager. This should be done so that they may be fully informed as to the nature of the plan or changes and be in a position to offer suggestions.

II. General Policies Governing Operation of Incentive Plan

A. The Hour-for-Hour Bonus Plan

The Hour-for-Hour or 100 Per Cent Full-Share Bonus Plan shall be standard throughout the company.

Under this plan the employee is paid a bonus for all the productive hours saved over predetermined measured standards. The bonus is on an accumulative basis for a full shift, hours earned each shift being added to the previous total of bonus hours earned. In the event the standards have not been met for a shift, no penalty will be inflicted. All participants begin each new work day or shift with a clean record.

Bonus is calculated and paid on the basis of incentive hours only. In calculating bonus earned, only work covered by standard time allowances, as stated and described on the standard authority forms, will be considered.

Work not covered by standards or such time classed as relief, spell, or waiting time shall be excluded from all bonus calculations and payments unless an exception is clearly specified in the approved manner.

Bonus earnings are calculated on the basis of the same hourly rate as is the regular base pay.

B. Approval of installation

The chief industrial engineer of the plant, the plant manager, the department heads affected, and the engineer making the installation should approve the installation before it is made effective. (In multiplant companies where there is a general management staff, they should also approve the installation.)

C. Changes in installation in effect

Any recommended changes in a policy manual of procedure governing the wage incentive plan, once it has been installed, must be submitted to the plant manager and to the general industrial engineering division for approval.

Planned changes of a major nature in an old installation must have the same approvals before being made effective.

Emergency changes of a minor nature and normal routine maintenance changes in an approved installation may be made with the approval of the plant chief industrial engineer, with coverage on the changes being given the general industrial engineering division within a reasonable length of time and in the approved manner.

D. Reports on earnings

Properly designed reports, to reflect individual earnings and results obtained, should be provided for in each individual installation. Procedure must be instituted for posting results promptly. For example:

1. Daily bonus reports (before noon the following day).
2. Pay period bonus report (second day following the last day of the period).

E. Standards

1. Permanent and Temporary Standards

a. All standards are permanent unless otherwise specified. Permanent standards are not to be revised unless there has been a change in equipment, methods, or materials which affect one or more elements of the standard. In case of revision, only those parts or elements of the standard affected shall be revised.

b. Temporary standards will be superseded by a permanent standard when the reasons for their having been made temporary are removed, or another temporary standard may be issued if another temporary change is made.

2. Complaint on a Standard. Any request for a check study on a standard must be made in writing, signed by the department head and his direct supervisor, and sent to the industrial engineering department. Figure 5 is a sample of the form to be used for this purpose.

3. Request for a Standard on a New Job. A request for a standard on a new job must originate with the department head. The standard is not to be established, however, until definite methods have been worked out. (See Figure 5 for form used.)

4. Placing Operations Covered by Standards on Non-incentive. An incentive operation to be worked as a non-incentive operation must have the joint approval, in writing, of the department head and the plant chief industrial engineer. This approval may be noted on the regular report of production to the bonus clerk.

5. Excess Standards

a. Use of excess standards. When variables or conditions enter certain operations to the degree that a time longer than standard time is required to perform the operation, an additional allowance or standard is established to cover the condition, known and shown as an excess allowance. This is a measured allowance.

The use of an excess standard must be approved by the plant chief industrial engineer.

b. Report on use of excess standards. At the end of each pay period, when excess standards have been used, an accumulated excess report should be prepared showing the nature and total of all excess hours allowed and the expense involved. This report should be sent to the department head, plant man-

THE MANUFACTURING CO.

To:_____ Location_____

Plant No._____

Department_____

Request for Time Study and/or Standard Authority

Date scheduled_____

New work_____ Time scheduled_____

Old work_____

Job description_____

Remarks _____

_____

Authority issued

Requested by_____

Issue No._____

Date_____ Approved by_____

By whom_____

FIGURE 5.

ager, vice president of manufacture, and the general industrial engineering division.

F. Standard authority (To use bonus standards)

These forms are made out only by the industrial engineering department and are the official authority to use the specified bonus standards. (See Figure 6.)

The operation number on these forms is the code number of the operation.

FIGURE 6. OPERATION AND WORK STANDARDS PERMANENT AUTHORITY

Sheet 1 of 2 Sheets

THE MANUFACTURING COMPANY
OPERATION AND WORK STANDARDS
PERMANENT AUTHORITY

FACTORY NO. 3

DEPT. CORRUGATING SECTION DATE EFFECTIVE 10-1-43

COPY TO	STANDARD FOR
Corrugating Department Plant Accountant Production Planning Department Industrial Engineering Department General Industrial Engineering Department	Cutting A style cases on #1430 Cutter 300-2

OPERATION NUMBER	SPECIFICATION OF WORK
300-2	BONUS STANDARDS
	"B" Flute cartons only--Feed one sheet at a time on full cuts.
	Two sheets at a time on punch holes only.
	Standard allowance in minutes/100 cartons cut.
	Standard Time
	Class Carton size (sq. in.) Min./100 cartons produced
	I Over 600 to 1200 7.2
	II Over 1200 to 1800 7.5
	Punch holes only--Two fed at a time.
	PI* Over 600 to 1200 sq. in. 5.2
	*Class I only is covered. This punching occurs only on small cases that require removing punch on first operation to bring tuck flap cutters close together. Time study required on larger cases.
	No make-ready standards. This work done by department machinist.
	DESCRIPTION OF OPERATION
	Standard crew — 1 Operator (male)
	Layout and work place arrangement as specified on 9/1/43
	See Master Record.
	A. Operation
	1. Lay up stock to feeder table (jogging evenly for ease of feeding).
	2. Feed machine (one sheet at a time on regular cuts). Pick up one blank sheet with R. H., while L. H. removes one finished sheet from the machine and discharges it into hopper. Feed next sheet into machine with R. H., L. H. holding sheet in position, releasing R. H. for securing next blank sheet. (Operator is able to utilize only every second stroke of the machine for there must be one idle stroke for stripping.) Feed two at a time only on punched holes.

APPROVAL

Plant Manager Dept. Head Ind. Eng.

FIGURE 6. OPERATION AND WORK STANDARDS PERMANENT AUTHORITY

Sheet 2 of 2 Sheets

THE MANUFACTURING COMPANY
OPERATION AND WORK STANDARDS
PERMANENT AUTHORITY

FACTORY NO. 3

DEPT.	SECTION	DATE EFFECTIVE 10-1-43
COPY TO		STANDARD FOR
		Cutting A style cases on #1430 Cutter (Continued)
		300-2

OPERATION NUMBER	SPECIFICATION OF WORK
300-2	3. Jog finished pieces and stack neatly on skid.
	4. Lay waste sheets aside on skid.
	5. Shovel trim from bin at rear of machine to waste truck.
	6. Move loads to the work place from the storage area with hand truck.
	7. Move loads to the storage area from the work place with hand truck.
	8. Oil machine as required.
	B. Make Ready
	Operator has no part in make ready. Make ready done entirely by the department mechanic or machinist.
	EQUIPMENT
	1-#1430 cutter with special knives for cutting A style cases
	Reeves variable-speed drive
	Maximum speed 105 r.p.m. — Min. 26½ r.p.m.
	Recommended operating speed — 66 r.p.m
	1-Feeding table built over machine
	1-Floor mat for operator
	1-Crescent wrench (adjustable-end stop)
	1-Oil can
	1-¼ in. Allen wrench
	1-Mechanical-lift truck available
	1-10 in. grain-type shovel with 30 in. handle
	MATERIALS
	"B" flute cases slotted at printer for A style cases (not flapcut). Cartons previously flapcut retard this operation; therefore flapcutting is to be performed afterward.
	SPECIFICATIONS
	As per instructions on factory order, or sample furnished.

APPROVAL

John W. Able	W. S. Brown,	P. B. Smith
Plant Manager	**Dept. Head**	**Ind. Eng.**

The standard time values given on the standard authority are break-even time values, or zero bonus point (0 per cent).

The specification of work gives a description of the work to be done and any reference to other sources of data that may be necessary.

This authority to be official must bear the signatures of the department head, plant manager, and plant chief industrial engineer.

G. Method of handling operator's time on new jobs which require time studies

Operators will be paid their guaranteed hourly base rate on new jobs until such a time as time studies have been made, a schedule of standard times developed, and the standard authority showing the standard time allowed is delivered to the foreman. After the standard is determined, with the consent of the operator, it may be made retroactive to the time the operator started on the job.

H. Method of handling operator's time on new jobs to which the present schedule of standard time allowances applies

On jobs that do not have a standard established by standard authority, but are covered by a schedule of standard time allowances or standard data tables already in use, the operator will be placed on incentive upon receipt of the assignment by him. He will be notified when the task is assigned to him that the standard will be given him at once. When at all possible, standards will be developed for all jobs before they are assigned.

I. Allowances

1. Special Allowances and Exceptions. Special allowances and exceptions to established bonus standards and allowances that are not covered in the manual of procedure governing the installation must receive the approval of the general industrial engineering division before being made.

Decisions which require immediate action will, of course, continue to be made by local management with the provision that the decision is subject to final approval by the general industrial engineering division before a policy is permanently established.

2. Allowances for Training Employees. Allowances are to be made for operators to learn the proper method and acquire the proper skill to perform an operation in the standard time.

a. "Ladder" rating scale for experienced operators.

(*1*) *General.* A bonus rating scale or "ladder" based on the individual's average bonus earnings for the past twelve weeks (to date) will be established for each worker. This average is determined by dividing the total net bonus hours earned by the total actual incentive hours worked by the operator.

Figure 7 is a sample of the form to be used in developing the "ladder" rating scale. The department supervisor fills in the authorization form (Figure 8) for the payment of the "ladder" rating scale and sends it to the plant chief industrial engineer for approval, who in turn sends it to the bonus clerk to be used in computing the bonus.

(*2*) *Transfer to unfamiliar job.* When an employee is temporarily transferred from a familiar incentive job to an unfamiliar one, for the convenience of the management and when his regular work is still available, he shall be guaranteed his "ladder" rating for the specified training period. This "ladder" applies only when the employee is working on an operation for the first time or when a long period has elapsed allowing the employee to forget the task. In the latter case the allowed training period is shortened, based on the judgment of the plant chief industrial engineer and the department head. The operator is notified at the start of the job how long the "ladder" will apply.

(*3*) *Discontinuance of "ladder."* In the event that such a worker earns more than his "ladder" rating, he will receive his actual earnings. When this point is reached, the "ladder" must be discontinued automatically.

(*4*) *Inexperienced worker with experienced worker.* In the event that an inexperienced man is placed with an experienced operator or group for training, the experienced operator or operators are guaranteed his or their "ladder" rating for the specified training period. As the amount of influence an inexperienced operator's production may have on the group's production varies with the particular set-up, the application of the "ladder" under these conditions should be tempered in the judgment of the plant chief industrial engineer and the department head.

(*5*) *The supervisor's participation in the "ladder."* Supervisors who normally participate in the average bonus earned by a number of operators receive only the per cent bonus actually earned. They receive no benefit from the operator's "ladder." At times, such as slack periods when

FIGURE 7

THE MANUFACTURING COMPANY

Department_____

Plant No._____ SHEET_____ OF_____

Location_____ LADDER RATING SCALE

Employee	% Bonus — Period Ending		% Bonus — Period Ending		% Bonus — Period Ending		% Bonus — Period Ending		% Bonus — Period Ending	
	This Period	Av. Last Six Per.	This Period	Av. Last Six Per.	This Period	Av. Last Six Per.	This Period	Av. Last Six Per.	This Period	Av. Last Six Per.

supervisors are temporarily working on direct labor, they receive no " ladder " based on their bonus earnings as supervisors. They may, however, receive the benefit of a " ladder " on their past direct production earnings.

b. Learner's compensation curve. The purpose of this curve is to minimize for new employees the loss of bonus they

FIGURE 8

THE MANUFACTURING COMPANY

To:_____ Location _____

Plant No._____

Department_____

Authority for Application of Learner's Curve or Ladder Rating Scale

Learner's Curve_____

Ladder Rating Scale_____

Name_____ Clock No._____

Remarks _____

_____

Hours to Apply_____ Approval_____ (Foreman)

Approval_____ (Industrial Engineer)

may suffer because of their unfamiliarity with the work. The form illustrated in Figure 8 serves as the authority for applying this curve.

The curve to be used is (For 0 to 30 actual standard minutes per hour add enough standard minutes to equal 45 allowed standard minutes per hour):

Actual Standard Minutes Produced per Hour	*Allowed Standard Minutes per Hour*
31	46.0
32	46.5
33	47.0
34	47.5
35	48.0
36	48.5
37	49.0
38	49.5
39	50.0
40	50.5
41	51.0
42	51.5
43	52.0
44	52.5
45	53.0
46	53.5
47	54.0
48	54.5
49	55.0
50	55.5
51	56.0
52	56.5
53	57.0
54	57.5
55	58.0
56	58.5
57	59.0
58	59.5
59	60.0
60	60.0

Ordinarily there is no occasion to use this curve except when a considerable amount of instruction or practice is required to obtain effective effort. Its application in any particular case should be on the judgment of the department head and the engineer handling the assignment. Standard learning periods are developed for applying this allowance.

3. Training Periods. Training periods are established for all operations to govern the length of time that the above allowances apply. An estimate is made of the time required to train a normal

operator in the proper method of performing the operation and for the operator to reach break-even production.

For operations with no records of training the plant chief industrial engineer and the department head set a temporary standard. When sufficient data have been compiled, they set a permanent training period for the operation. These data are accumulated on a record of " ladder " and " learner's curve " data.

A copy of all permanent training periods is furnished the general industrial engineering division for central file data. Until definite guides have been established, all permanent training periods should be approved by the general industrial engineering division to maintain uniformity among plants.

Any time, incentive or non-incentive, spent learning an operation is applied against the operator's allowed training period for the operation.

4. Delay Allowances. Short non-recurring delays, up to and including 6 minutes, which are not under the control of the incentive workers, are included in the standards. Any continuous delay over 6 minutes, not controllable by the worker, is allowed in full. In the event a series of short intermittent delays of less than 6 minutes occur, the supervisor should make due allowance for them on the Daily Report of Operation (Figure 9). The payroll department makes a summary report (Figure 10) of all delays during a pay period.

5. Allowance for Samples, Experimental and Non-standard Jobs. When an item is being run for which, because of lack of standardization of methods, no bonus standards or allowances have been established, it is classed as experimental or non-standard work, and as such is excluded from all bonus and efficiency calculations. The actual time for running such an item is also excluded from bonus operating hours.

J. Bonus accounting

1. Responsibility. Since the plant accountant is responsible for the accuracy of all bonus accounting, the plant chief industrial engineer should make certain that some individual, designated by the plant accountant, is thoroughly trained to handle properly the bonus accounting involved in the incentive plan.

2. Audit.

a. General. All bonus computations are subject to periodic audit by the general accounting division.

b. Plant. The plant accountant and the plant chief industrial engineer should also periodically audit the bonus account-

FIGURE 9

THE MANUFACTURING COMPANY

DAILY REPORT OF OPERATION

Plant No.______________ Department______________ Date______________

Clock No.	Name	Base Code and Operation No.	Item	Bonus		Time		Quality	Standard Time Unit	Standard Hours	Actual Hours	Remark
				Yes	No	Start	Stop					

FIGURE 10

THE MANUFACTURING COMPANY

Date_____

Plant No._____ DELAY AND WAITING TIME REPORT Copy to:

Location_____ Period Ending_____

Dept._____

Delay Code	Date — Time in Hours and Tenths of Hours																Totals	Remarks
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
700–1																		
700–2																		
700–3																		
700–4																		
700–5																		
700–6																		
760																		
770																		
780																		

Total hand work hours this period (incentive) _____

Total machine hours this period (incentive) _____

Signed_____

700–1 Machine breakdown
700–2 Waiting for stock
700–3 Waiting for instructions
700–4 Waiting for new job
700–5 Power failure
700–6 Dispensary time
760 Excess — Overtime premium
770 Excess — " Ladder "
780 Excess — Beginners (learners)

ing to satisfy themselves that all policies are being adhered to and that the plan is functioning properly.

3. Payment of Bonus.

a. Time. It is the policy of the company that whenever possible all bonus earnings shall be included in the check with the hourly earnings for the same period.

b. Duplicate bonus. Duplicate bonus must not be paid.

If operators or gang leaders hold over on the following shift, they are to receive no bonus on this time *unless they replace a regular operator or gang leader.*

If an employee, hourly or salary, participates in more than one bonus plan, the sum of his per cent participation should not exceed one full share (100 per cent).

c. Payment of overtime premium to incentive workers. When an incentive worker is being paid an overtime premium, the hourly rate upon which the overtime premium is calculated is equal to his total earnings for the week (including incentive and non-incentive work and bonus), exclusive of overtime premium, divided by the total actual hours worked on incentive and non-incentive work.

This procedure conforms with the provisions of the Federal Wage and Hour Act and the Walsh-Healy Bill, both of which state further that the calculation shall be for the current work week.

EXAMPLE

Calculation of Overtime Premium and Total Week's Earnings:

Total actual hours worked in week (on incentive)	25
Bonus earned on incentive hours	20%
Total actual hours worked (day rate, non-incentive)	20
Total actual hours worked — incentive and non-incentive	45
Hours worked overtime	5

Hourly base rate = $0.80

Calculation of Total Earnings Exclusive of Overtime Premium:

For hours on incentive 25 × $0.80	$20
For bonus on incentive hours 20% × $20.00	4
For hours on non-incentive or day work 20 × $0.80	16
Total earnings exclusive of overtime premium	$40

Rate upon which overtime premium is paid:

$40.00 ÷ 45 hours = $0.889 per hour

Overtime premium:

$5 \times \frac{1}{2} \times \$0.889 = \$2.22$

Overtime is paid for all hours over 8 continuous hours worked per day or over 40 hours worked per work week, whichever is the greater. If in the above example the cumulative hours worked in excess of 8 hours per day were 6 hours, then the overtime calculation becomes:

$$6 \times \tfrac{1}{2} \times \$0.889$$

Total Week's Pay, Including Overtime Premium $42.22

d. Payment for attending meetings. When an hourly paid employee attends a meeting planned and instituted by the management of the company, the time spent in the meeting is considered non-incentive work time, whether or not the meeting is voluntarily attended. The calculation of earnings above applies, the employee being paid his regular hourly base rate for the hours involved.

e. Minimum fraction of hour for bonus purposes. Hours worked on incentive are recorded to the nearest minute, but bonus earnings are calculated on the basis of the nearest 6 minutes.

f. Payment of bonus when more than one hourly rate is involved in the shift. Bonus is computed on the employee's guaranteed base rate for the job.

When a worker on incentive works on different jobs that involve different hourly rates, his bonus earnings are calculated separately on each hourly rate by applying the hourly rate to the bonus hours earned. The resultant individual earnings, or earnings and losses, are totaled to arrive at the net bonus earnings for the shift.

EXAMPLE: EMPLOYEE 4858

Bonus hours earned	$1\frac{1}{2}$ ×	$0.80 =	$1.20 bonus
Bonus hours earned	1 ×	$0.85 =	.85 bonus
Total bonus earnings		=	$2.05

4. Payment of Bonus When Individual Works as Member of More Than One Group during a Shift in the Same Department. The percentage of bonus for each group for the shift is calculated and applied proportionately to the number of incentive hours the individual worked in each group. The hours earned or lost in each group are then added to determine the total hours earned for the shift.

EXAMPLE

Incentive hours worked with Group A =	5.0 ×	20% bonus =	1.00
Incentive hours worked with Group B =	3.0 ×	10% bonus =	.30
Total incentive hours worked	8.0		
Bonus hours earned			1.30

Bonus hours earned 1.30 ÷ Total incentive hours worked 8.0 = 16.2%

5. Production on Which Bonus Is to Be Paid. Only production meeting the established specifications will be counted in calculating the bonus earned. Any deviations from this rule must be approved by the department head and the plant chief industrial engineer.

6. Bonus Losses.

a. Bonus losses incurred in a department must be deducted from bonus earned in the same department during the same shift before arriving at net bonus earnings. Bonus losses incurred while working continuously more than regular shift hours, such as a double shift, may be held separate from all other bonus earnings or losses at the discretion of the plant chief industrial engineer.

b. Bonus losses incurred in one department must not be deducted from bonus earned in another department.

c. At the end of the pay shift *all* net bonus losses are canceled.

7. Terminations and Transfers of Employees (Hourly and Salary).

a. When an employee's job is terminated, all bonus payable should be paid immediately, preferably at the time his final wage check is issued.

b. In case of transfers to another plant, all bonus payable should be paid to the employee at the time of transfer.

c. If the employee who is transferred or whose job is terminated participates in a keyman incentive, an equitable and fair adjustment is made.

d. If a salaried employee is transferred temporarily to assist another plant, he is paid the regular bonus earned by his home plant.

e. In the event that a salaried employee is visiting another company plant for educational purposes, he receives his regular bonus, except when it is necessary to replace him and pay bonus as a result of his absence. In other words, no duplicate bonus is paid.

8. Bonus Paid for Reporting to Work When No Work Is Available.

a. When no work is done. When an employee reports for work and finds no work available, he is not paid a bonus even though paid for a specified number of hours for reporting to work.

b. When some work is done. When an employee reports for work and actually begins work at the start of a shift, and works

less than the minimum hours specified for that plant under such circumstances, he must be paid for that minimum number of hours. This pay includes bonus earnings if it is an incentive job, these bonus earnings to be calculated on the basis of the average for the shift or pay period, whichever is greater.

c. Exceptions. In the event that strikes, stoppages in connection with labor disputes, breakdowns of equipment, or acts of God interfere with work being provided, the provisions for payment of bonus as given under paragraph 2 do not apply.

9. Issuance of Bonus Earnings. The general rule is that bonus earnings are included in the regular pay check, under the same procedure established by the general accounting division for the company in the preparation of wage checks for hourly employees. These bonus earnings are shown separately from the hourly earnings in a box provided on the check for that purpose. This enables a man to see exactly what his bonus earnings were for the pay period.

In all cases bonus earnings payable are computed by the plant accounting department.

10. Participation Based on Average Department Percentages. Bonus payments to all hourly employees, including hourly supervisors, should be computed on actual hours worked. However, when actual hours worked under this type of participation exceed 8 hours per day, then only 8 hours are used in computing bonus payable.

This practice, however, does not apply to employees who put in more than 8 hours a day as a result of substituting for absent employees. In that event, they are paid bonus on such additional hours.

The purpose of this policy is to avoid paying bonus for hours when the department or crews are not working. In the event that the department or crews work overtime, the hourly supervision and other hourly employees participating on the average of the department would then participate on the additional actual hours worked.

It is not the intention of this policy to limit employees' bonus participation to 8 hours when their regular duties require more than 8 hours to perform and the basis or reason for their participation remains unchanged. Such situations are in the minority and should be handled in individual installations as they arise by providing proper exemption.

11. Status of Participants. Once an employee participates in bonus, it is difficult to remove him from future participation

when the job does not change. Therefore, any proposed elimination of participants should be decided by the plant manager.

As stated, these policies are not intended to be all inclusive or designed to fit all installations. They are, however, indicative of the type and nature of policies that must be designed to govern a wage incentive installation.

Chapter VII

WAGE ADMINISTRATION

The Importance of Proper Wage Administration

Nothing is more important to a wage incentive plan than its maintenance. The same requirement holds for the hourly base rate structure plan. We know that, regardless of how carefully and accurately a rate structure or wage incentive plan is developed originally, it will surely fail in its practice if it is not rigidly maintained. This is true because the conditions under which wage incentive plans and hourly base rate structure plans are founded do not remain static. Therefore the plans themselves cannot remain static. Normal and regular means must be clearly and definitely established to see to it that all changes are fully weighed as to their effect on existing wage structures and that the proper adjustments indicated are made. If this is not done, the plans soon become obsolescent and out of balance. Such a condition as this quickly leads to discontent and loss of faith on the part of the hourly employees.

The need for such maintenance must be clearly recognized by management at the very beginning of a wage program in a plant. Adequate provision must be made for it, and nothing should be permitted to interfere with it or disrupt it. At first glance this is an obvious requirement, but experience has proved that it is too often disregarded. The pressure of work in the industrial engineering department itself and the demands of management for special analyses and the like make it difficult to resist letting the work of wage maintenance slip. Therefore it is management's responsibility to see to it that their demands for studies and analyses do not harm this vital phase of wage administration. It is also the responsibility of the engineers, supervision, and hourly em-

ployees as well, to guard against harmful inroads on the time and means required to maintain their wage plans properly by insisting that such inroads be stopped.

The Basis for a Sound Wage Administration Program

The basis for a sound wage administration program requires first of all the use of a balanced, well-thought out incentive plan and a sound comprehensive hourly base rate structure plan. These plans must not only be comprehensive in scope and content but must also be designed for thoroughness of administration.

The Manual of Procedure Governing the Installation. In instituting a wage incentive plan, for example, a manual of procedure should be prepared to give a clear description of the plan, its policies, controls, and standards. It should include further a statement of the purpose of the plan, its scope, and the expected earnings on the part of employees.

Policy Section of the Manual. This manual should also include a general policy section, as described in the preceding chapter. These policies are used to govern all wage incentive plans in use in the plant and should be clearly and completely stated. A special policy section is included if the installation is of such a nature that it must have special treatment, as would be required by unusual situations in participation, delays, basis of payment, and the like. These situations may be the result of some unusual features of the manufacturing conditions, materials, or equipment. Herein also should be listed any probable changes that affect either the production standards or the nature of the installation. These special policies should be listed by production centers for sake of clarity and ready reference.

Bonus Accounting Section. The bonus accounting section of the manual should cover in detail the exact steps involved in gathering production data and calculating bonus earnings. The section would include sample bonus calculations covering at least the more common examples by production centers, if not all of them.

Methods and sources of securing and checking daily production information, including samples of all forms, must be included. It is essential to good bonus accounting practice that both the method of obtaining production counts and the method of checking the accuracy of those counts should be given. This is more important than it appears to be at first glance. Every effort must be made to plug any and all possible loopholes in obtaining accurate production counts quickly. A detailed description of all necessary calculations, including the provisions and regulations concerning the posting of bonus information, should be given. This would include the various allowances for delays and variations in work, materials, and equipment.

Participation Section. The participation section should show not only who participates and on what basis, but also the production unit or units from which the production count is derived. The type of set-up, that is, group or individual bonus, should be designated by operations or group of operations.

Standards Section. The standards should be supported by detailed data, organized and compiled in such a manner as to be of ready reference. Each standard should be written up in a clear concise manner, with copies provided the department head as well as the accounting department. (See Figure 6.) The form used in preparing this report should state clearly what operation the standard is for and should include a designating description.

The specification of work covered by the standard should include a complete description of the operation, the tools and equipment used, the inspection requirements, and the spoilage standards if any, existing at the time the standard was set. Thus at any future time it can be established beyond a doubt just what conditions existed at the time the standard was set. Then if any changes have been made from the procedure as outlined, the standard automatically becomes obsolete, and a new one should be requested.

This description becomes the authority to use the standard

when properly signed, and can be known as the standard authority. To become effective it should be signed by the foreman of the department, the plant manager, and the engineer issuing the authority.

The Problems of Proper Administration of a Wage Incentive Plan

Changing Work Requirements. The problems of proper maintenance or administration of a wage incentive plan are many and require painstaking and vigilant follow-up. One of the greatest of these problems is changing work requirements, and care must be taken to see to it that the work requirements in an operation do not change with the standard remaining the same. These changes in work content may be, and frequently are, of a creeping nature. That is, they are not individually major changes but as a group or as a whole become important.

The majority of the errors or obsolescence found in standards are on the loose side. This is true because there is usually more likelihood that the amount of work required will diminish rather than increase. Thus it requires vigilance on the part of the supervision and the engineers to see to it that these changes are known and measured as they occur. The supervision must guard against a natural tendency to encourage a general slight loosening of standards in order to have the departmental performance look better, as well as to favor his employees. Yet experience has shown that standards must be kept exactly up to date to the degree possible and practical. If this is not done, we soon find our old enemy, inequality of standards, again in our midst.

Obviously allowances and changes in standards to reflect added work present no problem. The hourly employees themselves will usually see to it that these changes and conditions are promptly accounted for in the standards, if the engineers and supervisors show any laxity in that respect. Naturally we cannot expect from them the same zeal to have reductions in standards when work is taken out of the opera-

tion. The engineers and the supervision must depend largely on their own initiative to maintain the proper balance in this direction.

Planned Changes. Most changes in conditions, especially those of a major sort, are known and planned changes. This is true whether the change is one of materials, specifications, equipment, methods, or tooling. Regardless of whether these are of a sort to increase or decrease a standard, they do not present a major administration problem since they are known and planned changes. A full discussion and explanation of the change to the employees concerned before any actual change is made usually gain their acceptance of the change. *The important point is to make these changes as they occur.* The difficulty in making a change downward increases geometrically to the length of time the old obsolete standard is permitted to remain in effect after the change obsoleting it has been placed in practice.

When the change is the result of a suggestion or improvement worked out by an operator, the suggestion is often made to leave the old, now loose, standard in effect for a definite period as a reward to the employee. *This is distinctly bad practice.* Under no circumstances can such a gesture be justified. Let an outright monetary reward be given the operator for his idea based on the savings resulting from it, but change the standard the proper amount as soon as the change in the operation is put in practice.

Creeping Changes. The problem of handling the small or creeping changes in the operation is the most difficult one to handle. Even when known these changes present a problem in sound wage administration. The average supervisor and engineer are reluctant to make a change in a standard every time some small change in the operation occurs. It is disturbing to the employees and also requires making a number of clerical and data changes. At the same time the changes cannot be ignored.

There are different ways of handling this problem, but this one has proved successful. Recognizing that many of these

changes affect the standard only to the degree considered to be within the realm of accurate standard setting, we should establish a policy as to what shall be the minimum adjustment that will be made in a standard. This limit can be 10 per cent. In other words, if the change in question affects the standard less than 10 per cent the standard is not changed.

The change and its effect on the standard are, however, entered on the back of the standard authority in question, with the date of the change shown. This entry is initialed or signed by the foreman, the employee or employees affected, the engineer, and the union steward if there is one. Then, as each small change is made, the same procedure is followed. When the next change added causes the accumulated changes to equal or exceed 10 per cent, the standard is adjusted to compensate for the whole of them. Thus the slate is wiped clean at one time. This practice is essentially fair to all concerned, permits proper maintenance of standards, and at the same time is practical from a clerical and data maintenance viewpoint.

The Assignment of Responsibility for the Program

A regular follow-up or maintenance program should be instituted the moment the wage incentive plan is placed in operation. The responsibility for this work should be assigned to an engineer, preferably one that worked on the installation. He should be provided whatever additional help he needs to do a good thorough job.

As stated, this program is important from an employee relations standpoint. A regular follow-up permits the immediate measurement and adjustment for any changes made and prevents loose application of standards which, if ignored, would distort the value of the plan to both the hourly employees and the management. A close follow-up prevents any minor irritation from growing into a major one. Sufficient time should be provided to permit the engineer to work with each operator or group of operators to insure that they

are fully trained in the proper method of performing the work to which they are assigned. Follow-up of this nature does much to help convince the employees of the essential fairness of the installation and of the management's desire to make it fully acceptable to them.

This matter of allowing the engineer sufficient time and assistance to do a thorough maintenance job is also important from the standpoint of making further methods improvements. Additional recommendations for improvement in work methods usually come to light as a natural result of the wage incentive installation. A diligent follow-up permits the necessary cataloging and analysis of these recommendations for their possible value and effect upon the standards in force. It also encourages the continuance of recommendations by both supervision and hourly workers. Often recommendations are submitted in great quantities by the employees during the installation period. Afterwards suggestions are few. The engineer assigned to this work should bend every effort to help the supervision keep the general cost reduction program alive and before the employees as a vital program.

The Scope of the Wage Administration Program

The scope of the wage administration or maintenance program should be established by the department head, the engineer, and the head of the industrial engineering department. One of the first steps in this process is to list, in order of their importance, all items that in the opinion of that group should have further analysis. These special items or projects would be included along with those which could be considered as regular items. These regular follow-up items should include the following:

1. Make a periodic audit of bonus accounting and procedures

This audit is to insure accuracy of bonus accounting as well as to seek refinements and simplifications in procedure.

2. Analyze daily the unsatisfactory or unusual performances above and below the expected bonus percentages.

This is done to seek correctives and to check adequacy of standards. The need for further training of an employee or employees would be discovered. It is essential that the cause or causes of these unusual variances be determined promptly and that corrective action be taken promptly.

3. Hold periodic meetings with the supervision to discuss improvements in the installation and other cost reduction plans

It must be kept in mind and kept in reality that the supervision is the guiding light in the never-ending campaign for lower costs. Therefore it is essential that meetings be held at frequent intervals to keep that relationship vibrantly alive.

4. Make studies and develop data covering new items not on incentive as well as changes in established methods

These studies are made to keep the incentive coverage at the highest level possible and to keep all standards current.

5. Issue all new standards and changes in current standards

6. Continue development of standard data to improve their accuracy and scope

This will permit more rapid incentive coverage and maintenance with a minimum number of time studies being required.

7. Make periodic reviews of all standards and allowances against production to check their accuracy

8. Check effect of all specification, method, and equipment, changes on standards and standard data

9. Prepare or cause to be prepared progress and performance reports of a control nature

10. Investigate all proposed new methods and processes designed to improve production and make recommendations concerning them

11. Maintain a log of all changes and improvements made in the department.

Preventive maintenance also pays in the case of wage incentive plans. It is much simpler and much easier to maintain incentive standards properly than it is to attempt to correct an unbalanced situation in regard to standards of

work after they have reached the point of becoming employee grievances.

Of all the factors that affect sound wage administration, the most important by far is the recognition by management of its need and importance, and then the translation of that recognition into determined positive action.

Chapter VIII

COST CONTROL REPORTS

One of the major elements of an industrial engineering program, of which wage incentives are a part, is to provide management with simple and adequate cost control reports. Thoroughness and accuracy must be the watchwords of those who develop the bases for these reports as well as for the reports themselves.

The soundest basis for such a report is the comparison of actual performance with standards that are measured. When this is the case, the degree of accuracy of the comparison is much higher than if the standards were based on past averages, estimates, or the like. Standards that are measured have been analyzed, classified, and weighed both quantitatively and qualitatively so that there can be little doubt of their contents. Thus they can be used and relied upon with greater confidence than if they were determined by some other method.

To guard against too much detail and too many reports, the exception principle should be used in the development of these control reports wherever practicable. By the exception principle is meant that the report be prepared only in those instances when the actual fails to meet the standard.

For the purpose of control we shall discuss four basic reports which, in addition to budgets, will to a large degree provide management with sound controls. Should these four not be sufficient in any given situation, we must design others to augment them, striving always for simplicity. The four reports described in this chapter are:

1. Performance and Cost Reduction Report.
2. Record of Hours Worked and Bonus Earned.
3. Excess and Waiting Time Reports.
4. Excess Cost Reports.

The first two are regular periodic overall control reports; the last two are of the exception principle type and would be made out only when there is something to report.

Development of Basic Data for Control Reports

In making an industrial engineering approach to a department, one of the first things to do is to make a detailed survey of the departmental costs. This survey would include the analysis of the methods of wage payment and labor, material, and waste costs, and their distribution for a carefully selected period.

This period should be one that could be called typical and representative of the operating results in that department. The length of the period chosen depends primarily on the variables normally experienced in the department. It should be long enough to make certain that the picture obtained is truly representative. A month is usually chosen, and that is the recommended average period. The period should be selected and approved by the department head and the plant manager.

The data so obtained familiarize the analyst with the operating costs of the department. They serve as a basis on which to predetermine the effect of any proposed layout, equipment, or method change, or wage incentive installation. Later they become the basis to reflect the effect of any change made. Thus, they provide an accurate measuring stick of present labor, material, and waste costs against which to measure future progress in the operation of the department.

As these data are to be used later for comparative purposes, it is important that production and payroll records be available in proper detail. It is essential that the hours worked on each center or operation be distinct and the corresponding production be available by item. These things are necessary so that production standards can be applied to determine the relative effectiveness demonstrated during the preinstallation period. For example, it is not sufficient to know that during a certain 8-hour period so many man-hours were spent

assembling four thousand parts. It is also necessary to know the exact size and specifications of those parts.

If these data are inadequate or unavailable in existing records, it sometimes becomes necessary to institute the proper records during current periods in order to obtain the required information in the proper detail. The reasons for this step should be fully discussed with the department head. The step should also have the approval of the plant manager before it is taken.

Performance and Cost Reduction Report

General Comments. This report is designed to provide the plant manager and the department head with a comparative report showing overall progress made in effecting cost reductions within a department and the plant as a whole as well as to provide useful operating data as a tool for control. (See Figure 11.) It operates by comparing each current pay period against a carefully selected past pay period to determine the cost reduction effected in a particular department by all agencies working towards that end under the supervision or guidance of the department head. The report is not only for the current period, but for all periods to date.

Such a measuring stick must be based on a non-varying unit or it will lose its effectiveness as time passes, and as conditions such as hourly rates, specifications, and products change. The unit used in this report is *standard hours produced.*

Standard hours produced is defined as the amount of work that an average man, with average skill, experienced in the work in which he is engaged, can and should do in one hour without undue exertion. As can be seen, this amount of measured work will not vary regardless of changes in product, material, equipment, and the like. A standard hour represents so much measured effective work regardless of what it is expended upon. Thus it makes an ideal measuring stick for long-term comparisons because a measured hour of work remains a measured hour of work, whereas other terms, such

as unit costs and the like, are directly affected by conditions, price, rate changes, and the like.

The management ratios shown on the report for control purposes are also expressed in hours as well as percentages, which makes them comparable over a long period of time.

Major Uses of the Report. As stated above, the report is designed primarily to measure overall cost reduction within a department, plant, or company, with standard hours produced the major unit of measure. The report will not be made effective until such a time as measured standards are placed on a sufficient number of operations to warrant making out the report.

Nevertheless, the report is designed so that it can be used to good advantage to measure progress being made up to the time that measured standards are placed on the operations. The method of making the comparison with each current period is covered in detail later on in this chapter. For the purpose of illustrating the use of the report previous to the establishment of measured standards, let us assume certain conditions.

The major cost reduction program in a given department, as planned, consists of four distinct phases. They are:

Changes in specifications, or simplification in the design of the product.

Changes in layout of department to reduce handling and other labor and delays.

Installation of improved equipment and methods.

Wage incentive installation.

Again let us assume that each phase would be relatively distinct from the others, and the department head wishes to measure the contribution each phase made to the overall results.

This knowledge would be of value in determining whether or not the actual cost reduction realized from each phase of the program approached the estimates made. It might be of further value in weighing the probable results of the next

phase of the program in view of the results obtained by the completed phases. This measurement of results obtained would be accomplished by selecting a current period at the end of each phase of the program and calculating a new set of preinstallation data based on the cost of performing the work under the new conditions. Thus comparisons can be made not only against the original basic and permanent preinstallation or reference period, but also with the secondary periods representing production costs at the conclusion of each phase.

Another simpler and perhaps more desirable use of the report prior to the establishment of measured standards would be in a situation such as the following:

The department head wishes to inaugurate or continue a program of general cost reduction in his department. It is not possible for the industrial engineers to devote sufficient time to that department to develop measured standards for a period of time, yet he wishes to measure the progress being made in the meantime. This can be accomplished, as explained above, by calculating the report on a non-measured or non-incentive basis, not by phases but on the whole. Thus the department head is provided with a measuring stick of the progress he is making in reducing costs, even though his department is not on measured standards.

Key Information Shown on Report. The attempt has been made to keep the report as simple as possible and yet provide valuable controls for the operation of the department. Of the information shown on the report, eight factors could be considered as furnishing the major or key controls. (See Figure 11.) They are:

1. Payroll cost per standard hour (3E)
2. Average hourly earnings (3F)
3. Per cent bonus (3G)
4. Direct hours per indirect hour (4C)
5. Total direct and indirect hours per supervision hour (4E)

6. Per cent relationship incentive hours to total hours (5B)
7. Per cent relationship waiting time hours to total hours (5F)
8. Operators below 0 per cent bonus (7)

Calculation of Departmental Report. Once the report has been instituted by the industrial engineers with the aid of the plant accounting department, it becomes a function of the plant accounting department to calculate the report at the end of each pay period, and send copies to the following individuals:

1. Plant manager.
2. Vice president in charge of operations.
3. Director of industrial engineering.
4. Plant chief industrial engineer.
5. Department head.

The department head's copy need not show sections 6 and 9, which deal with the financial results obtained. The plant chief industrial engineer will see to it that the department head is kept informed of these results.

Plant Summary Report. In those plants which have departmental reports in two or more departments, it is of value to the plant manager to have a plant summary report prepared showing the progress being made in the plant as a whole. Copies of this report are sent to the same individuals as receive the departmental reports with the exception of the department heads. (See Figure 12.)

FIGURE 11

THE MANUFACTURING COMPANY

Plant No. 3

Copies To: Mr. Able
Mr. Smith
Mr. Jones
Mr. Brown

DEPARTMENTAL SEMI-MONTHLY PERFORMANCE AND COST REDUCTION REPORT

Department A Period Sept. 15, 1943

1. Pay Periods on Incentive Fifteen
2. Previous Highest Bonus Rating on a Volume Comparable to Volume This Period.
   A. Period 3-31-43 % Bonus 8.9 Volume 9743 Standard Hours
   B. This Period's Bonus Rating % Bonus 11.2 Volume 9886 Standard Hours

Preinstallation Comparisons	Description	Preinstallation	This Period	% Preinstallation
3. Incentive Work Only				
A. Total Chargeable Employees	Equivalent Full Time	250	140	56.
B. Total Chargeable Hours	Incentive Work Only	15696	8854.41	56.
C. Total Chargeable Earnings	Incentive Work Only	7848	4980.90	63.
D. Total Standard Hours Produced	Incentive Work Only	10800.87	9886.14	92.
E. Payroll Cost per Standard Hour	$3C \div 3D$	.736	.504	68.
F. Average Hourly Earnings	$3C \div 3B$	.50	.563	113.
G. Per Cent Bonus	$[(3D \times 100) \div 3B] - 100$	−31.1	11.2	162
4. Of Direct Labor, Indirect Labor, and Supervision				
A. Total Chargeable Hours Direct Labor		9243	5158.45	56.
B. Total Chargeable Hours Indirect Labor		10623	5308.24	50.
C. Direct Hours per Indirect Hour	$4A \div 4B$	.87	.97	111.
D. Total Supervision Hours	Standard Work Period	960	424	44.
E. Total Direct and Indirect Hours per Supervision Hour	$[(4A + 4B) \div 4D]$	21.	25.	119.

Preinstallation Comparisons	Description	Prein-stallation	This Period	% Prein-stallation
5. Of Incentive, Non-incentive, and Waiting Time Hours				
A. Total Chargeable Hours	Incen., Non-incen., Wait Time	19866	11157.75	56.
B. % Relationship Incentive Hours to Total Hours	$3B \div 5A$	79.0	79.4	101.
C. Total Chargeable Hours	Non-incentive Only	4170	1612.28	55.
D. % Relationship Non-incentive to Total Hours	$5C \div 5A$	21.0	14.5	98.
E. Total Waiting Time Hours		—	691.06	—
F. % Relationship Waiting Time Hours to Total Hours	$5E \div 5A$	—	6.2	—

6. Savings Effected This Period

A. Incentive Work Only

$$\frac{9886.74}{(\text{Production This Period in Standard Hours}—3D)} \times \frac{.232}{(\text{Difference between Preinstallation and This Period}—3E)} = 2293.72$$

B. Non-incentive Work Only

$$\frac{1080}{(\text{Preinstallation Operating Basis})} - \frac{723}{(\text{This Period Operating Basis})} = 357.00$$

7. Classification of Incentive Operators

20% and Over	Between 15 & 19%	Between 10 & 14%	Between 0 & 9%	Below 0%	Total
21	30	25	31	25	132

8. Excess This Period

A. Premium Time	$ 5.99
B. Ladder-Learner	6.68
C. Non-Std. Op.	139.10
Total	$ 151.77

9. Departmental Financial Results

Gross Savings Effected

Previously Reported	This Period	To Date
$ 31,324	$ 2651	$ 33,975

Approved John W. Able
Plant Manager

DESCRIPTIVE SUMMARY
OF FIGURE 11

SEMI-MONTHLY PERFORMANCE AND COST REDUCTION REPORT

DEPARTMENT. The name of the department covered by the report.

PERIOD. The report is prepared at the end of each regular pay period, the date shown being the last day of the pay period covered.

1. Pay periods on incentive

The total number of pay periods the department has been on incentive, including the one covered by the report.

2. Previous highest bonus rating on a volume comparable to the volume of the current period

A. Period. The date of the period that had the comparable total standard hours.

Per Cent Bonus. The percentage of bonus earned that comparable period.

Volume — Standard Hours. The total standard hours produced that period.

B. The same information as shown in *A* for the current period.

3. Preinstallation comparisons — incentive work only

A. Total Chargeable Employees includes all employees in the department, both incentive and non-incentive, exclusive of supervision and clerical. The number of employees is expressed as equivalent full time and is calculated by dividing total hours worked (all hours) by the standard number of hours per period. The nearest whole number is taken.

B. Total Chargeable Hours includes all hours spent on incentive work, regardless of degree of bonus participation. This includes any supervision working on direct or indirect measured standards.

C. Total Chargeable Earnings includes all wages and bonus paid all incentive workers for the hours worked under 3*B*, regardless of degree of bonus participation. All Premium Time is excluded.

D. Total Standard Hours Produced includes all hours used as the basis for calculating bonus. Where a direct incentive worker participates indirectly on the average of a group or groups, his standard hours are charged into the total on the

basis of his bonus calculations and on the basis of a full share, regardless of his actual participating share.

E. Payroll Cost per Standard Hour is calculated by dividing the total chargeable earnings by the total standard hours produced.

F. Average Hourly Earnings is calculated by dividing the total chargeable earnings by the total chargeable hours.

G. Per Cent Bonus is calculated by multiplying the total standard hours by 100 and dividing that figure by the total chargeable hours and from that quotient subtracting 100, the difference being a plus or minus percentage.

4. Preinstallation comparisons of direct and indirect labor and supervision

A. Total Chargeable Hours Direct Labor includes all hours spent on direct labor, both incentive and non-incentive. This includes any supervision hours on direct labor classed under 3*B*.

B. Total Chargeable Hours Indirect Labor includes all hours spent on indirect labor, both incentive and non-incentive. This includes any supervision hours on indirect labor under 3*B*.

C. Direct Hours per Indirect Hour is calculated by dividing the total number of direct labor hours by the total number of indirect hours.

D. Total Supervision Hours is the total number of all hours spent on supervision, based on the actual number of supervision hours worked by hourly supervision plus the number of standard hours per pay period for each salaried supervisor. In the event that a supervisor's time is shared with other departments, the normal fractional part of his time chargeable to each department is used. This figure also includes all clerical hours.

E. Total Direct and Indirect Hours per Supervision Hour is obtained by adding the total chargeable hours direct labor (4*A*) and the total chargeable hours indirect labor (4*B*) and then dividing the sum of these two by the total supervision hours (4*D*).

5. Preinstallation comparisons of incentive, non-incentive, and waiting time hours

A. Total Chargeable Hours includes all hours spent on incentive, non-incentive, and waiting time, exclusive of supervision.

B. Per Cent Relationship Incentive Hours to Total Hours is calculated by dividing the total chargeable incentive hours (3*B*) by the total chargeable hours (5*A*).

C. Total Chargeable Hours — Non-incentive Only — is the total of all hours spent on work not covered by standards, both direct and indirect, with the exception of supervision and waiting time hours.

D. Per Cent Relationship Non-incentive to Total Hours is calculated by dividing the total chargeable hours — non-incentive only (5*C*) — by the total chargeable hours (5*A*).

E. Total Waiting Time Hours includes all hours lost for any reason that are shown separately and excluded from incentive or non-incentive hours. Supervision hours are not considered.

F. Per Cent Relationship Waiting Time Hours to Total Hours is calculated by dividing the total waiting hours (5*E*) by the total chargeable hours (5*A*).

6. Savings effected this period

A. Incentive Work Only is calculated by multiplying the difference in payroll cost per standard hour between the preinstallation period and the current period by the total number of standard hours produced during the current period.

B. Non-incentive Work Only is calculated by subtracting the actual operating labor costs for this period for this class of work from the calculated labor costs for the same work developed on the basis of labor costs shown on the wage incentive survey during the preinstallation period for this work.

As work classed as non-incentive is placed on incentive, the results obtained on that work will then be shown under "*A* — Incentive Work Only." As the department approaches its maximum incentive coverage, the work shown under *B* will be a steadily diminishing amount and that under *A* a steadily increasing amount.

7. Classification of incentive operators shows the number of incentive operators falling in each designated group.

8. Excess this period

A. Premium Time includes all money paid as overtime or holiday premium in the department for the pay period.

B. Ladder-Learner includes all money paid out under the ladder bonus rating scale and the learner's compensation allowance.

C. Other — all other excess moneys paid should be shown separately.

D. Total — shows total of all money paid out as excess over regular pay.

9. Department's financial result — Gross savings effected. Under " Previously Reported " is shown the cumulative total of savings effected in the department to date. Under " This Period " is shown the total savings effected this pay period. This figure is taken to the nearest dollar. Under " To Date " is shown the total " Previously Reported " plus the total " This Period." The " Previously Reported " and " To Date " figures will start at zero on January the first of each year, regardless of the length of time the report has been in effect.

FIGURE 12

THE MANUFACTURING COMPANY

Copies To: Mr. Jones
Mr. Able
Mr. Brown
Mr. Magee

Plant No. 3

SEMI-MONTHLY PERFORMANCE AND COST REDUCTION REPORT
SUMMARY ALL DEPARTMENTS

1. Pay Periods on Incentive Twenty-two Period Ending Sept. 15, 1943
2. Previous Highest Bonus Rating on a Volume Comparable to the Volume This Period.
   A. Period 6/30/43 Bonus Rating 14.8 Volume _____ Standard Hours
   B. This Period's Bonus Rating 14.6 Volume _____ Standard Hours

Preinstallation Comparisons	Description	Preinstallation	This Period	% Preinstallation
3. Incentive Work Only				
A. Total Chargeable Employees	Equivalent Full Time	530	430	81
B. Total Chargeable Hours	Incentive Work Only	30784.2	20752.5	67
C. Total Chargeable Earnings	Incentive Work Only	13852.6	10397.01	75
D. Total Standard Hours Produced	Incentive Work Only	21302.7	22682.4	106
E. Payroll Cost per Standard Hour	$3C \div 3D$	.650	.458	70
F. Average Hourly Earnings	$3C \div 3B$	.450	.501	111
G. Per Cent Bonus	$[(3D \times 100) \div 3B] - 100$	−30.8	9.3	158
4. Of Direct Labor, Indirect Labor, and Supervision				
A. Total Chargeable Hours Direct Labor		20206.4	17234.5	85
B. Total Chargeable Hours Indirect Labor		21264.3	17103.2	80
C. Direct Hours per Indirect Hours	$4A \div 4B$	.95	1.01	106
D. Total Supervision Hours	Standard Work Period	2000	960	48
E. Total Direct and Indirect Hours per Supervision Hour	$[(4A + 4B) \div 4D]$	20.7	35.8	172

Preinstallation Comparisons	Description	Preinstallation	This Period	% Preinstallation
5. Of Incentive, Non-incentive, and Waiting Time Hours				
A. Total Chargeable Hours	Incen., Non-incen., WaitTime	41470.7	34420.7	83
B. % Relationship Incentive Hours to Total Hours	$3B \div 5A$	74.0	60.3	81
C. Total Chargeable Hours—Non-incentive Only		10686.5	13418.6	127
D. % Relationship Non-incentive to Total Hours	$5C \div 5A$	26.0	38.9	149
E. Total Waiting Time Hours		–	249.6	–
F. % Relationship Waiting Time Hours to Total Hours	$5E \div 5A$	–	.8	–

6. Excess This Period

A. Premium Time—	8.02
B. Ladder—Learner	7.12
C. Non-standard Operations	139.10
D. Total	154.24

7. Payroll Savings Effected This Period

A. Total of Departmental Savings This Period—	$4,355.
B. Less Clerical and Other Expense Required to Operate System—	263
C. Net Payroll Savings Effected This Period—	$4,092

8. Total Financial Results to Date

Net Plant Savings

Previously Reported	This Period	Total to Date
$ 73,500	$ 4,092	$ 77,592

Approved John W. Able
Plant Manager

DESCRIPTIVE SUMMARY
OF FIGURE 12

COMBINED PERFORMANCE AND COST REDUCTION REPORT – ALL INCENTIVE DEPARTMENTS

1. The data shown on this report are the combined figures taken from the individual department reports.

Sections 1, 2, 3, 4, and 5 are handled in the same manner as the correspondingly numbered sections in the departmental performance and cost reduction report.

Section 6 in the combined report corresponds to section 8 in the departmental report.

2. Section 7 — payroll savings effected this period

A. Total of Departmental Savings This Period is the sum of all gross savings reported on the individual departmental reports (Figure 11).

B. Less Clerical and Other Expenses Required to Operate System. Under this heading is placed the total clerical and miscellaneous expense added directly as a result of the operation of the incentive system.

C. Net Payroll Savings Effected This Period is the total savings effected by all departments after the total operating expense (*B*) has been deducted from the total gross savings (*A*).

3. Section 8 — total financial results to date

This section is the total result of all departments' results and corresponds to section 9 of the departmental results. This section also starts at zero on January the first of each year.

RECORD OF HOURS WORKED AND BONUS EARNED

Daily Report. Departmental daily record of hours worked and bonus earned report (Figure 13) for each department on incentive is made out before noon of the following work day by the accounting department. Ordinarily the industrial engineers prepare the first reports and, after simplified routines are worked out, turn the preparation of the reports over to the accounting department.

The purpose of this report is to show the bonus earnings today and to date for each productive employee working under the incentive plan, and to furnish the employees and

the supervisor of the department with a classification of hours worked, such as incentive, non-incentive, waiting time, and the like. This provides a direct control tool for low bonus efficiencies, waiting time, and non-incentive work.

This report is prepared for the supervisor of the department and the plant chief industrial engineer. The supervisor's copy is posted in a central location in the department so that each employee may see how much bonus he earned.

Pay Period Summary Record of Hours Worked and Bonus Earned. Pay period summary record of hours worked and bonus earned report for each department on incentive is made out on the second day following the end of the pay period by the accounting department, using the same form as shown in Figure 13. The purpose of this report is to summarize percentage of bonus, bonus hours earned, and a classification of hours for each individual and totals for the department for the entire pay period.

This report is prepared by the accounting department for the plant manager and supervisor of the department, with copies for the plant chief industrial engineer and the general industrial engineering division. A copy would also be prepared for the payroll department to authorize the payment of bonus. The departmental supervisor's copy should be posted in the department in order to notify each employee of the bonus hours and per cent he earned that pay period.

Combined Use of Bonus Hours Earned Report for Budget Purposes. In those departments having incentive systems, the bonus hours earned report could serve as a dual control covering the daily report of budget performance in addition to the regular bonus performance. Since bonus standards are used as budget rates in incentive departments, some duplication and work can be eliminated without sacrificing control over costs by combining the daily budget report with the record of hours worked and bonus earned report.

When wishing to use the combined report add a column to the right (see Figure 13) of the total hours column for the budget allowances. On the theory that incentive operations

are controlled by being on bonus, no budget allowances are calculated daily for that work. An exception to this could be where a large amount of non-incentive and waiting time is interspersed with the incentive work. Then the non-incentive work and waiting time could be lumped together and a budget allowance determined for the total. On all classes of labor not covered by incentives, daily budget allowances are calculated and shown by class in the standard manner. No overs or unders are calculated or shown. Semi-monthly, a complete summary budget report for the period would be prepared in the usual manner.

FIGURE 13

THE MANUFACTURING COMPANY

RECORD OF HOURS WORKED AND BONUS EARNED

PLANT_____ DEPARTMENT_____ DATE_____

DEPARTMENTAL UNIT

Name — Group — Gang	Bonus Hours Earned		% Bonus Earned		Hours					
	To-day	To Date	To-day	To Date	Incentive	Non-Incentive	Waiting	Supervision and Inspection	Total Hours	Budget
Total Charges Excluding Incentive Hours										
Totals										
Per Cent of Total Hours										

DESCRIPTIVE SUMMARY OF FIGURE 13

RECORD OF HOURS WORKED AND BONUS EARNED

1. Plant Number. The number or name of plant covered by the report.

2. Department. The name of the department covered by the report.

3. Date. The date of the performance.

4. Departmental unit of measure. The name of the departmental unit of measure.

5. Name, group, gang. The name of the operation, type of labor or employee, the number or name of the group or gang.

6. Bonus hours earned (today). The bonus hours earned for the day's performance.

7. Bonus hours earned (to date). The bonus hours earned for the day's performance, plus the bonus hours earned for previous performance in the pay period.

8. Per cent bonus earned (today). The bonus hours earned divided by the incentive hours worked for the day's performance.

9. Per cent bonus earned (to date). The bonus hours earned to date divided by the incentive hours to date.

10. Incentive hours. The number of hours spent by the employee or group on work measured by time standards (today only).

11. Non-incentive hours. The number of hours spent by the employee or group on work that is not measured by time standards (today only).

12. Waiting hours. The number of hours spent in waiting (today only).

13. Supervision and inspection. The number of hours spent for all supervision and inspection (today only).

14. Total hours. Total number of hours for incentive, non-incentive, waiting, supervision, and inspection (today only).

15. Budget hours. The budget hours for all work not covered by incentives. No budget hours need be applied against machines or groups where portions of work are on both incentive and non-incentive. The supervisor can use per cent bonus, waiting time, and non-incentive as the daily controls for incentive work, since these items indicate whether or not the budget is being met.

16. Total charges (hours) excluding incentive hours. The total of all hours excluding incentive work.

17. Totals. The totals of bonus hours and per cent bonus earned today and to date, and totals of the different classifications of hours.

18. Percentage of total hours. The percentage of total hours for each classification of hours worked.

Excess and Waiting Time Reports (General)

Plant Departmental Excess and Waiting Time Report. The departmental excess and waiting time report (Figure 14) for each plant showing departments on incentive only is made out at the end of each pay period by the accounting department. The industrial engineers prepare the first reports and, after simplified routines are worked out, turn the preparation of the reports over to the accounting department. The purposes of this report are to show a comparison of departments on each major type of waiting time and to report the total man-hours of waiting time for the plant, attempting to provide the plant manager with a tool for control over lost time. This report is prepared for the plant manager, with copies for the director of industrial engineering, the plant chief industrial engineer, and all departmental foremen.

FIGURE 14

Copies to: Plant Manager
Director Industrial Engineering
Department Foreman
Plant Chief Industrial Engineer

THE MANUFACTURING COMPANY

DEPARTMENTAL EXCESS AND WAITING TIME REPORT

(Departments on measured standards only)

Plant No._____

Location_____ Period Ending_____

Delay Code	Classification of Delays	Dept. No.____ Total Man-Hours	Dept. No.____ Total Man-Hours	Dept. No.____ Total Man-Hours	Dept. No.____ Total Man-Hours	Dept. No.____ Total Man-Hours	Dept. No.____ Total Man-Hours	Dept. No.____ Total Man-Hours	Total All Depts. Total Man-Hours
700–1	Mach. Breakdown								
700–2–1	Wait for Basic Stock								
700–2–2	Wait for Mat'l or Supplies								
700–3	Wait for Instructions								
700–4	No Work (Scheduling)								
700–5	Power Failure								
700–6	Dispensary Time								
700–7	Wait for Trucks								
700–8	Recond. Mat'l								
700–9	Mach. Equip. Trouble								
	TOTAL WAITING TIME								
	% WAITING TIME EFFICIENCY								
56	Non-standard jobs								
57	Samples or Exper.								
	TOTAL SPECIAL								
750	Excess (General)								
750–1	Excess Non-std. Method								
750–2	Excess Non-std. Equip't								
750–3	Excess Non-std. Material								
	TOTAL EXCESS								
	% SPOILAGE								

DESCRIPTIVE SUMMARY
OF FIGURE 14

SEMI-MONTHLY PLANT DEPARTMENTAL EXCESS AND WAITING TIME REPORT

1. Plant Number. The number of the plant covered by the report.

2. Location. The location of the plant covered by the report.

3. Period ending. The report is prepared at the end of each regular pay period, the date shown being the last day of the pay period covered.

4. Department number. The number of the department covered by the report. The name of the department should be placed in the space beneath department number.

5. Delay code. The code number for the different classifications of delay time. This number aids in observing quickly or accumulating any desired classification of delay.

6. Classification of delays. The classification of delays is primarily a classification of delays by the cause of the delay. Space is available for any additional classifications.

7. Total man-hours. The total man-hours of delay in each department by the classification of the delay. These hours are accumulated from the reports of production on each machine or operation prepared in each department on incentive.

8. Total man-hours (all departments). The total man-hours delay is obtained by adding the delays opposite each classification for all departments shown.

9. Total waiting time. The total waiting time for all classifications of delays by departments and also for all departments.

10. Per cent waiting time. Total waiting time hours divided by the total of all hours operated, incentive, non-incentive, and waiting, excluding supervision and clerical, gives the per cent waiting time total. This is calculated for each department on incentive and also for the total of all departments.

11. Samples or experimental. The time spent in running samples or experimental jobs, incentive or non-incentive.

12. Non-standard jobs. The time spent on regular production equipment for the operation of jobs usually covered by incentives but for which the standards do not accurately measure the work being done. This will exclude sample and experimental time.

13. Total special. The total time for all classifications of special jobs by departments and also for all departments.

14. Excess general. The total excess time spent on jobs in each department classified as excess, that is, of a general nature.

15. Excess non-standard methods. The total excess time spent on jobs in each department classified as excess time due to operating under non-standard methods.

16. Excess non-standard equipment. The total excess time spent on jobs in each department classified as excess time due to operating non-standard equipment, such as group drives when individual drives are more economical.

17. Excess non-standard materials. The total excess time spent in manufacturing a product from non-standard materials.

18. Total excess. The total of all classifications of excess time for each department and for all departments.

19. Per cent spoilage. The total pieces spoiled divided by the good pieces produced plus spoilage gives the per cent spoilage. This is calculated by departments and for all departments.

Report of Excess Cost (General)

A departmental semi-monthly report of excess cost (Figure 15) for each department on incentive is made out at the end of each pay period by the accounting department. The industrial engineers prepare the first reports and, after simplified routines are worked out, turn the preparation of the report over to the accounting department.

The purposes of this report are to show the excess cost of manufacturing because of operating at non-standard speed or use of non-standard equipment, material, or methods, and as accurately as possible to compare these excess costs with the estimated amount of money required to eliminate the cause of the excess allowances. This report is prepared for the plant manager, director of industrial engineering, the plant chief industrial engineer, and the departmental foremen. When such excess is negligible or non-existent, the report need not be made out until such time as excess costs once again appear.

FIGURE 15

Copies: Plant Manager
Director Industrial Engineering
Department Foreman
Plant Chief Industrial Engineer

THE MANUFACTURING COMPANY

REPORT OF EXCESS COST

(Departments on measured standards only)

(Excess is additional measured time required for non-standard equipment, methods, materials)

Department_____

Plant No._____

Location_____

Period Ending_____

Classification of Excess Cost by Causes	Total Excess To Date	Est. Cost to Remove Cause of Excess	Date Excess Began	This Period		
				Hours Excess	Cost of Excess	Est. Cost to Remove Cause of Excess
Non-std. Equip. (Loading Devices)						
Non-std. Equip. (Unloading Devices)						
Non-std. Equip. (Driving Mechanism)						
Non-std. Equip. (Producing Machine)						
Non-std. Mat'l (Purchased)						
Non-std. Mat'l (Prepared by Selves)						
Climatic Conditions						
Customers Special Service Requests						
Non-standard Layout						
Non-standard Methods or Crews						
Miscellaneous						
TOTAL						
% EXCESS EFFICIENCY						

Note: % Excess efficiency is total hours excess divided by standard hours produced.

Recommendations for elimination of excess _____

DESCRIPTIVE SUMMARY
OF FIGURE 15

DEPARTMENTAL SUMMARY — REPORT OF EXCESS COST

1. Department. The name of the department in which the report is prepared.

2. Plant number. The number or name of the plant covered by the report.

3. Location. The location of the plant covered by the report.

4. Period ending. The report is prepared at the end of each regular pay period, the date shown being the last day of the pay period.

5. Classification of excess costs by causes. The classification of excess is primarily a classification of excess standard allowances by the chief causes for the excess. Space is provided for any additional classifications.

6. Total excess to date. The total cost of the man-hours of excess accumulated to date by causes of excess allowance.

7. Estimated cost to remove cause of excess. The estimated cost to remove the cause of the excess if it has been determined for each operation needing excess allowance is placed opposite each cause. This is also a "to date" figure.

8. Date excess began. The date on which the excess began to occur on any operation for the cause specified.

9. Hours excess (this period). The total man-hours of excess for the semi-monthly period by cause of excess allowances.

10. Cost of excess (this period). The total cost of the man-hours of excess for the semi-monthly period by the cause of excess allowance.

11. Estimated cost to remove cause of excess (this period). The estimated cost to remove the cause of excess is determined on each operation requiring excess allowances and placed opposite each cause for the excess occurring during this period.

12. Total (excess to date) — All causes. The total cost of the man-hours of excess accumulated to date for all causes of excess allowance.

13. Total (estimated cost to remove cause of excess). The total estimated cost for removing all causes of excess.

14. Total (hours excess — this period). The total man-hours of excess for all causes.

15. Total (cost of excess — this period). The total cost of the man-hours of excess for all causes.

16. Total (estimated cost to remove cause of excess — this period). The total estimated cost of removing all causes of excess allowed during this period.

17. Per cent excess efficiency of total standard hours produced. The total man-hours excess divided by total standard hours produced by the department.

18. Recommendations for elimination of excess. A brief description of the recommendations for elimination of major items of excess.

Summary Excess and Waiting Time Reports by Plants

In multiplant companies it may be found desirable to prepare a comparative report on the excess and waiting time by plants (Figure 16). This report is prepared by the general industrial engineering division and the information is taken from the plant departmental excess and waiting time reports (Figure 14). The last column on this plant report gives the total for that plant, and this figure is the one shown on the summary report for all plants. Copies of this report are given the vice president of operations, the plant managers, the director of industrial engineering, and the plant chief industrial engineer.

FIGURE 16

Copies to: Vice President of Operations
Plant Managers
Director of Industrial Engineering
Plant Chief Industrial Engineers

THE MANUFACTURING COMPANY

SUMMARY EXCESS AND WAITING TIME REPORTS BY PLANTS
(Departments on measured standards only)

Period Ending_____

Delay Code	Classification of Delays	Plant No.____ Total Man-Hours	Plant No.____ Total Man-Hours	Plant No.____ Total Man-Hours	Plant No.____ Total Man-Hours	Plant No.____ Total Man-Hours	Plant No.____ Total Man-Hours	Plant No.____ Total Man-Hours	Total all Plants Total Man-Hours
700–1	Mach. Breakdown								
700–2–1	Wait for Basic Stock								
700–2–2	Wait for Mat'l or Supplies								
700–3	Wait for Instructions								
700–4	No Work (Scheduling)								
700–5	Power Failure								
700–6	Dispensary Time								
700–7	Wait for Trucks								
700–8	Recond. Mat'l								
700–9	Mach. Equip. Trouble								
	TOTA . WAITING TIME								
	% WAITING TIME EFFICIENCY								
56	Non-standard Jobs								
57	Samples or Exper.								
	TOTAL SPECIAL								
750	Excess (General)								
750–1	Excess Non-std. Method								
750–2	Excess Non-std. Equip't								
750–3	Excess Non-std. Material								
	TOTAL EXCESS								
	% SPOILAGE								

Chapter IX

SUPERVISORY OR KEYMAN INCENTIVES

Definition

Supervisory or keyman incentives, as generally understood, are designed to award a bonus to a supervisor in proportion to his ability to control costs, quality, waste, and other factors for which he and his department are directly responsible.

The weight a particular department bears in the overall plant cost results must be included in the total consideration of the supervisory incentive plan to be used in that department. The amount of bonus earned under such a plan can be used as an overall measure of the department's efficiency, provided a sound basis for the plan has been established.

Should Supervisors Be Placed on Incentive?

This is a much debated point, with the majority of opinions at present probably being against placing supervisors on incentive. However, I believe that the major reason for opposing such incentives has been the failure in earlier installations to consider fully what factors should compose an equitable incentive plan for supervisors. Then, too, the lack of care, analysis, and maintenance that went into the earlier installations made them unsatisfactory in operation just as it did and would any incentive plan.

The argument is often advanced that a supervisor should not be paid a bonus to do what he was hired to do. This argument, plus the one that it detracts from his dignity, are, in my opinion, largely academic. No one can deny the stimulating effect of a well-designed financial incentive in encouraging the attaining or exceeding of equitably established goals. This stimulating effect is not lost on a man merely because he is a supervisor any more than it is lost on the

president of the company. The main problem is to design a properly balanced basis for the plan. If this is done the possibilities for good results from placing supervisors on incentive far outweigh the possibilities for bad results.

Another point often advanced against such plans is that they cause the supervisors to be constantly pressing for more liberal standards, thus making an unhappy situation in their relationships with staff departments. This possibility cannot be denied any more than can the possibility that such a plan will encourage a supervisor to put too much pressure on his workers and to slight the maintenance and upkeep of his department in order to obtain a better cost picture.

Either of these possibilities would soon be detected in actual practice and corrective measures would be taken. When the proper type of properly trained individual is in a supervisory position an incentive plan of the kind we are discussing tends to stimulate his qualities of leadership and fairness rather than the subversive qualities mentioned.

It is true of keyman incentives, as it is of any phase of management, that the closer you strive for and come to the optimum control of your business the higher degree of accuracy in controls you must attain and the higher the quality of managerial thinking and action you must exercise. If this be the case and goal then the beneficial results of such practices as keyman incentives can be obtained. If it is not the case and goal then it is best to leave this and other managerial refinements to those who are willing to pay the price of progress.

General Discussion of Keyman Incentives

In our discussion of this type of incentive we shall confine our remarks to its application in departments where measured standards are in use for incentive purposes.

An incentive plan for supervisors should be kept as simple and easily understandable as practicable. It should be designed so that performances can be taken directly from current bonus, efficiency, and budget records and reports in

order to facilitate calculations. The plan should be designed to control departmental wastes, quality, and costs. Care must be exercised to avoid prematurely instituting a keyman incentive plan before sufficient incentive coverage has been made and a thorough study of material usage, spoilage, and quality has been completed, thus insuring equitable standards.

Keyman incentives should recognize the fact that a supervisor is essentially the manager of his department, and it is his responsibility to see to it that those items affecting costs and quality are kept in line with the measured standards established in the departmental wage incentive and budget plans. It is essential to the success of a keyman incentive plan that measured standards be used in every possible instance. When necessary to use past performance as a guide in establishing a standard, the engineer must subject such data to a thorough analysis to determine what should be included and what should be excluded from the standard.

Major Control Factors

The first step in instituting a keyman incentive plan is to determine the major control factors against which actual performances on cost, quality, and wastes may be measured for improvement or lack of improvement. This control of costs may mean the selection of such key relationships or factors as per cent departmental budget efficiency, per cent plant budget efficiency, per cent bonus earned by departmental employees on incentive, per cent non-incentive time, per cent waiting time, per cent spoilage, and the like, which indicate trends of costs and control in those items affecting costs and production standards.

The control of waste may mean the establishment of control standards based on a thorough analysis of the causes of waste. This would include an analysis of past performance to compare it with the conclusions reached in the waste analysis and thus to determine improvement expected and savings to be realized. The materials used, and the manufacturing process as well, should be analyzed to determine

whether or not individual or group controls should be established by operations.

FIGURE 17

DEPARTMENT A

KEYMAN BONUS AWARD CHART

Departmental Bonus Earned		Non-incentive Plus Waiting		Plant Budget Efficiency		Departmental Budget Efficiency		Direct Materials Used	
(A) Dept. % Bonus	(B) Supvrs. % Bonus	(A) % Non-inc. + % Wait.	(B) Supvrs. % Bonus	(A) % Budget Effcy.	(B) Supvrs. % Bonus	(A) % Budget Effcy.	(B) Supvrs. % Bonus	(A) % Stand. Usage	(B) Supvrs. % Bonus
−1 to 10	−0.5								
0	0								
1	+0.2								
2	+0.4	50	−6.0						
3	+0.6	48	−5.0			92.5	−7.5		
4	+0.8	46	−4.0	89.0	−6	93	−6.5		
5	+1.0	44	−3.5	90.0	−5	93.5	−5.5	110	−9
6	+1.2	42	−3.0	91.0	−4	94	−4.5	109	−7
7	+1.4	40	−2.5	92.0	−3	94.5	−3.5	108	−5
8	+1.6	38	−2.0	93.0	−2	95	−2.5	107	−3
9	+1.8	36	−1.5	94.0	−1	95.5	−2.0	106	−2
10	+2.0	34	−1.0	95.0	0	96	−1.5	105	−1
11	+2.2	32	−0.5	96.0	+1.0	96.5	−1.0	104	0
12	+2.4	30	0	97.0	+2.0	97	−0.5	103	+1.0
13	+2.6	28	+0.5	98.0	+3.0	97.5	0	102	+2.5
14	+2.8	26	+1.0	99.0	+4.0	98	+1.0	101	+4.0
15	+3.0	24	+1.5	100.0	+5.0	98.5	+2.0	100	+5.0
16	+3.2	22	+2.0	101.0	+5.5	99	+3.0	99	+5.5
17	+3.4	20	+2.5	102.0	+6.0	99.5	+4.0	98	+6.0
18	+3.6	18	+3.0	103.0	+6.5	100	+5.0	97	+6.5
19	+3.8	16	+3.5	104.0	+7.0	100.5	+5.5	96	+7.0
20	+4.0	14	+4.0	105.0	+7.5	101	+6.0	95	+7.5
21	+4.2	12	+4.5			101.5	+6.5	94	+9.0
22	+4.4	10	+5.0			102	+7.0		
23	+4.6	8	+6.0			102.5	+7.5		
24	+4.8								
25	+5.0								
26	+5.2								
27	+5.4								
28	+5.6								
29	+5.8								
30	+6.0								

Select performance column (A) for each factor; read corresponding % bonus from column (B). Total % bonus to be paid the supervisor is the sum of the factors (1), (2), (3), (4), and (5). Plus bonuses are to be added, minus bonuses are to be subtracted in obtaining the total.

The control of quality may be obtained through the establishment of spoilage standards for pieces partially or completely spoiled. Here, again, the analysis of the causes of

spoilage must be made before establishing the standard and only that amount considered as inherent in the operation allowed. If the department is fully covered by incentive standards, this information is readily available.

After the major control factors are determined, consideration is given to the weight that will be assigned each factor in making up the total bonus to be awarded for normal performance. For normal performance the sum of all factors should equal 25 per cent bonus to be paid to the supervisors. This is in keeping with our recommended bonus percentage for hourly workers. The point of average performance, where no bonus is paid, and points of subnormal performance, deducting from bonus earned on other factors, should also be determined and established.

As stated, the summation and analysis of data used in developing such factors as waste and spoilage do, in most cases, consist of reviewing the data developed during the study and establishment of measured standards in the department.

KEYMAN BONUS AWARD CHART

A Bonus Award Chart should be prepared showing the bonus to be awarded for varying performances under each factor. Figure 17 is a sample of such an award chart. This chart should be kept as simple as possible and prepared in such a manner that the bonus can be read directly for any performance. The total per cent bonus paid the supervisor should be the sum of the per cent bonus under each factor. Plus bonuses should be added and minus bonuses should be subtracted in obtaining a total bonus to award the supervisor. For example:

	Supervisor's Bonus
Departmental % bonus (22)	4.4
% Non-incentive, plus % waiting time (13.0)	4.3
Plant budget efficiency (97.0)	2.0
% Departmental budget efficiency (98.5)	2.0
% Direct materials used (103)	1.0
Total % bonus to be awarded to the supervisor	13.7

FIGURE 18

REPORT OF KEYMAN BONUS EARNINGS

Copies to: Plant Manager
Payroll Department
Industrial Engineering Department
File

Plant No. _____
Location _____
Department _____
Supervisor _____ Period Ending _____

Bonus Factor	Actual Performance	% Bonus Earned	% Possible Earn'gs Normal	% Eff.
(1) % Departmental Bonus			5%	
(2) % Non-incentive Plus % Waiting Time			5%	
(3) % Plant Budget Efficiency			5%	
(4) % Departmental Budget Efficiency			5%	
(5) % Reduction in Materials Used			5%	
TOTAL			25%	

APPROVED: Plant Manager _____
Plant Chief Industrial Engineer _____

GENERAL POLICIES GOVERNING OPERATION OF PLAN

1. The per cent bonus earned by the supervisor should be calculated monthly. Each supervisor would be in-

formed of his earnings as soon as they are determined. (See Figure 18 for the sample of the notification form.)

2. Bonus earned should be accumulated for 6-month periods. The purpose of this policy is to let the money accumulate so that it represents a sizable payment when it is made. Usually such payments are made June 1 and December 1, just before vacation and just before Christmas. Such a policy is entirely optional and is usually decided by a majority vote of the supervisors participating.

3. The amount of bonus to be awarded should be the per cent bonus for each month times the supervisor's monthly base salary.

4. Monthly records should be wiped clean. There should be no carryovers of negative performance from one month to another.

5. All other policies should conform to the standard policies regulating the payment of bonus as discussed in Chapter VII.

Checking the Proposed Plan against Actual Performances

In order to check the mechanics of the keyman incentive plan against actual operations, a table such as that shown in Figure 19 should be prepared. Comparisons can be made quickly of total month-to-month performance, and the factors producing high and low bonuses may be easily selected for closer analysis.

Determination of Normal and Average Performance under Each Factor and the Weight Given It

The point of normal (25 per cent bonus point) and average (0 per cent bonus point) performance under each factor is determined from data developed and used in establishing standards and controls for use in the departmental wage incentive plan. Should there be a factor not covered by measured standards and not adaptable to measured standards, a thorough analysis of the conditions affecting that factor, and past

FIGURE 19

PER CENT BONUS EARNED

SIX-MONTH SUMMARY

DEPARTMENT A KEYMAN INCENTIVE PLAN

	Departmental Bonus Earned		Non-incentive Plus Waiting		Plant Budget Efficiency		Dept. Budget Efficiency		Direct Materials		Total % Bonus Earned
	Dept. % Bonus	Supvr. % Bonus	% Non-inc. Plus Waiting	Supvr. % Bonus	% Budget Efficy.	Supvr. % Bonus	% Budget Effcy.	Supvr. % Bonus	% Standard Usage	Supvr. % Bonus	
Dec.–June	14.4	+2.9	40.9	−2.7	97.0	+2.0	96.5	−1.0	102.0	+2.5	+3.7
Jan.–July	16.0	+3.2	36.5	−1.6	98.5	+3.5	99.6	+4.0	100.0	+5.0	+14.1
Feb.–Aug.	16.8	+3.4	36.0	−1.5	95.0	0	97.2	−0.5	105.0	−1.0	− 0.4
March–Sept.	17.3	+3.5	32.2	−0.5	97.5	+2.5	99.7	+4.0	104.2	0	+ 9.5
April–Oct.	16.1	+3.2	36.6	−1.6	94.0	−1.0	95.8	−1.5	99.0	+5.5	+ 4.6
May–Nov.	15.8	+3.2	37.6	−2.0	96.5	+1.5	96.7	−1.0	101.5	+3.2	+ 4.9
Six-Month Average	16.1	+3.29	36.6	−1.6	96.4	+1.4	97.6	+0.70	102.0	+2.5	+ 6.2

performances on it, should be made to insure including only data substantiated by fact as being inherent in that factor.

The weight allowed each factor should be finally determined after the amount of money controlled by each factor and the potential savings have been analyzed. It may be found that some factors affect departmental costs more materially than others and, therefore, it is advisable to allow greater weight to one factor than another. For example, a 10 per cent fluctuation in non-incentive and waiting time may not influence costs so much as a 5 per cent fluctuation in materials used. Yet care must be taken to allow sufficient weight to each factor to insure its not being disregarded by the supervisor without its seriously affecting his bonus. The extent to which improved performances may be expected and whether or not one factor will conflict with another may contribute to the weights selected.

Determination of Bonus Awards for Varying Performances under Each Factor

To determine the amount of bonus to be awarded for various performances under each factor, an analysis should be made of at least one year's performances under each control factor. This study will give some indication of the degree of emphasis to be placed on the various increments of the spread between average and normal performance, as well as penalties or rewards for exceeding these limits.

1. Departmental bonus earned factor

In the case of the departmental bonus earned factor the problem is relatively simple. Twenty-five per cent bonus earned by the workers on standards represents normal performance for them, and likewise represents normal for a department and for a supervisor. If it is decided to assign a weight of 20 per cent (5 per cent bonus) of the total of all factors to this factor to the supervisor for normal performance, then the 25 per cent departmental bonus performance will be set opposite 5 per cent supervisor's bonus, on the scale set up for it. Furthermore, since no bonus would be earned by the supervisor for 0 per cent departmental performance on this factor, we have the two necessary

points in establishing a bonus award scale, namely, the point of normal performance and the point of average performance. The increment of increased or decreased departmental per cent bonus would be 0.20 per cent (5 per cent ÷ 25 = 0.20 per cent).

2. Departmental budget efficiency factor

A. General Comments. The use of budget efficiency as a factor involves several problems. The budget controls all items of cost and expense in the department, which means that there will be a duplication of control on many of the cost items. For example, direct labor is on incentive and therefore would be controlled by the departmental bonus earned factor in addition to the budget efficiency factor.

In order to place proper emphasis on those accounts which have no other control than the budget, it appears advisable to separate these accounts from the others and base the budget efficiency factor on them alone. Cost accounts in a department that are controlled through no other source than budget efficiency are called single-controlled accounts for the sake of simplicity. Cost accounts that are also controlled by incentive systems, materials used efficiency, or the like, are called multicontrolled. Should this breaking out of single-controlled accounts not prove practicable in a given circumstance, there are other methods of handling this factor in a satisfactory manner, discussed in the following pages.

B. Average and Normal Limits. Budget efficiencies are determined from budget allowances versus actual costs. For the sake of example assume that 100 per cent budget performance is the expected normal and a 2½ per cent variation is considered the extreme through which costs should vary from budget allowances in a particular department. Then, 100 per cent less 2½ per cent, or 97.5 per cent budget efficiency can be established as the point of average performance.

If it is decided to assign a weight of 20 per cent (5 per cent bonus) of the total of all factors to this factor for normal performance under budgets, 1 per cent bonus will be awarded for each 0.5 per cent variation (5 per cent ÷ 5 = 1 per cent) between 97½ per cent and 100 per cent budget efficiency. It may be decided to vary the degree of allowance for performances out of the 97 per cent to 100 per cent range, in order to encourage supervision to stay within these limits. This would depend, to a large degree, on the possibility of a more or less wide swing of budget efficiency's being inherent in a particular department's operation.

If the single-controlled accounts are separated from the multi-

controlled, such a spread from average to normal of 97.5 per cent to 100 per cent budget efficiency could be set up for these accounts alone and calculated on that basis. This would simplify the development of the budget factor scale.

C. Use of Overall Budget Efficiency. If it is recognized that it might be simpler to use the overall department budget efficiency than to separate the accounts controlled only through the budget, the following procedures have been developed.

In using overall budget efficiency as a factor in the keyman incentives, it would be possible for the supervisor to pay little attention to the single-controlled accounts when they represent a small portion of the total, and still obtain a good budget efficiency should the scale of earnings under this factor not be properly weighted. Thus, proper weighting must be given these single-controlled accounts in establishing the bonus scale for this factor. If the factor is developed properly, the overall budget efficiency may be used directly as shown on the cost and budget reports.

On the basis of 100 per cent being normal for the budget efficiency factor and 97.5 per cent budget efficiency being the break-even point, it is now only necessary to work out the variation permissible in order to provide the proper weight to the single-controlled accounts. As stated, if all accounts are single controlled, then the 2½ per cent spread would be used in developing the scale. If all accounts are not single controlled, proper weighting for varying percentages of single-controlled accounts, as compared with the total number of accounts and their relative value, must be provided as indicated in the following tables.

10% single-controlled costs	0.25%	Allowable variation in budget efficiency between normal and break-even or average points.
20% " " "	0.50%	
30% " " "	0.75%	
40% " " "	1.00%	
50% " " "	1.25%	
60% " " "	1.50%	
70% " " "	1.75%	
80% " " "	2.00%	
90% " " "	2.25%	
100% " " "	2.50%	

The above figures were determined from the following formula, which assumes that 100 per cent budget efficiency will be attained on those accounts controlled by other factors such as an incentive plan.

$$\text{Weighted \% department budget efficiency} = \frac{(\text{\% multicontrolled costs} \times 100\% \text{ budget efficiency}) + (\text{\% single-controlled costs} \times 97.5\% \text{ budget efficiency})}{100\% \text{ multicontrolled and single-controlled costs}}$$

If it is assumed that 20 per cent of a department's costs were controlled by no other factor than budget efficiency, our allowable variation between normal and break-even performance would be 0.50 per cent, as indicated in the preceding table.

The scale for the budget efficiency factor might then be as follows:

% Department Budget Efficiency	*Supervisor's % Bonus*
94.5	−7.5
95.0	−6.5
95.5	−5.5
96.0	−4.5
96.5	−3.5
97.0	−2.5
97.5	−2.0
98.0	−1.5
98.5	−1.0
99.0	−0.5
99.5	0
99.6	+1.0
99.7	+2.0
99.8	+3.0
99.9	+4.0
100.0	+5.0
100.5	+5.5
101.0	+6.0
101.5	+6.5
102.0	+7.0
102.5	+7.5

There is one danger in using this device. If multicontrolled accounts are below 100 per cent efficiency to any degree, the penalty under this factor could be unduly severe since this poor performance would also be reflected unfavorably in the other factors making up the total keyman plan, thus inflicting a double penalty.

An alternative plan for using overall budget efficiency and yet apply the proper weight to these single-controlled accounts would

be to hold the 97.5 per cent and 100 per cent spread from average to normal and vary the increments within that spread to reflect the single-controlled accounts properly. Such a scale might appear as follows:

% Department Budget Efficiency	*Supervisor's % Bonus*
94.5	−7.5
95.0	−6.0
95.5	−4.5
96.0	−3.0
96.5	−2.0
97.0	−1.0
97.5	0
98.0	+0.5
98.5	+1.0
99.0	+1.5
99.5	+2.5
99.8	+4.0
100.0	+5.0
100.5	+5.5
101.0	+6.0
101.5	+6.5
102.0	+7.0
102.5	+7.5

The principal advantage that this scale might have is that it does not offer so severe a double penalty should one or more of the multicontrolled accounts be below normal as does the other scale. Yet this scale does emphasize the importance of the single-controlled accounts by the sharp increase in bonus earnings as the budget efficiency reaches the 99.5 per cent point and goes to 100 per cent efficiency.

The exact make-up of any scale for a department depends upon the findings of the analysis made in that department, and these scales are used only as examples.

3. Overall plant budget efficiency

It is important that an overall plant factor be included in each supervisor's bonus plan, a practice which tends to insure the supervisor's keeping in mind his relationships with the rest of the plant. If this is not done, a supervisor in his driving for lower costs in his own department may adversely affect the costs of other departments in the plant. This factor then is designed to

keep before him his responsibilities in the overall plant cost picture as well as in his own department.

The value this factor should have in a supervisor's bonus plan depends upon the influence his departmental costs have on the total plant costs. If his department accounts for 20 per cent of the plant total, this factor should carry a 20 per cent weight (5 per cent) in his bonus calculations. Should some unusual circumstance exist where the actual cost relationship of a department is low but its ability to influence processing costs in other departments is high, additional weight may be given this factor.

4. Reduction in materials used factor

In those departments where materials represent a sizable portion of the total cost, and the amount of materials used can be controlled, a separate factor reflecting progress in this respect should be set up. These controls may be based on using only specified amounts and kinds of material or developing methods whereby less material can be used. Here, again, the data to be analyzed in establishing this factor will be found largely in the data used in establishing the measured standards and controls for use in the department budget and incentive systems.

Where necessary to use past performance as a source of data, care must be exercised to eliminate all data not justifiably a part of the accredited data to be used in establishing the standard. A study of each individual department's problems will determine how the standards can best be determined and applied and the nature of the scale that will be set up for this factor. It is important to consider the potential money savings involved in establishing both the weight of this factor and the spread of the scale established to control it.

Another point that may influence the weight given this factor, in addition to actual material usage, is the ability to control and measure this usage by operations. If it is difficult or impossible to control this factor by operations and thus make it a direct part of the regular departmental incentive plan, it may be necessary to increase materially the weight of this factor in the supervisor's incentive plan. Thus it would become a major responsibility of the supervisor to concentrate on these factors in order to prevent undue waste and spoilage.

5. Spoilage factor

Spoilage being a factor in nearly all operations, the data developed in conjunction with establishing measured standards will be readily available and usable in establishing the average and

normal allowances for this factor. Here, again, an analysis of past performance gives some indication of the degree of variation in spoilage that has been experienced and thus aids in setting up the control scale. Such a comparison also indicates the potential savings under this control.

6. Non-incentive plus waiting time factor

When the state has been reached in the incentive installation in a department where it is time to place the supervision on bonus, the potential degree of incentive coverage should be known. The number of operations that do not lend themselves to being placed on incentive will vary between departments but they can be designated and their relationship to the whole definitely established.

This potential percentage of coverage plus an allowance for unavoidable waiting time, if any, should establish the normal point for this factor. The average point is determined largely by analyzing the possible influx of new work that would require time to place on standard and the steadiness of the flow of this new work. The fact that this factor is designed to encourage the supervisor to see to it that his coverage is kept at maximum, and his waiting time at a minimum, should be kept in mind in establishing the scale for it.

7. Checking the factor bonus scales

After the scales for each factor have been determined and are in somewhat the same order as indicated on the bonus award chart (Figure 17) maximum bonus and maximum penalties should be checked in order to have the table as a whole somewhat in balance. Figure 17 awards a maximum bonus for all factors of 36.0 per cent and a maximum penalty of 33.5 per cent, although no attempt is made to establish maximum earnings limits.

Source and Description of Each Factor

It should be possible to take the information required to calculate the supervisor's incentive directly from established control reports. They would include the daily bonus reports, daily, weekly, or monthly budget reports, and other types of reports and records as described in Chapter VIII.

Other Control Factors

Other control factors that might be used are the relationship of direct labor to indirect labor, the decrease in cost

per standard hour, the per cent capacity operated, and the like. Since these factors may be duplications, in one way or another, of the factors indicated above, or cannot be directly controlled by the supervisor, considerable thought should be exercised before including them in the plan. In some departments, however, some other factors may be instituted for the purpose of correcting a particularly bad condition, but it is usually desirable to limit the number of factors to five.

Conclusion

The particular plan, as outlined, is relatively simple and easy to administer. It attempts to solve the problem of rewarding a supervisor in proportion to his ability to improve performances on each major cost factor in his department. The various performances on these factors can be obtained from current reports with a minimum of extra work. The design of the plan is such that it eliminates the necessity for developing various efficiencies which would parallel control factors already established for waste, quality, and other costs from an overall viewpoint.

This particular plan is not necessarily the only one or type of plan that can be successfully used. However, in this discussion of it I hope that I have illustrated the problems involved in developing a supervisor's incentive plan as well as offering a possible solution. A final word of caution in the use of supervisor's incentive plans is due here to the extent of urging again that the controls used as the basis for the plan be balanced and sound. If a control is out of line or unsound in any manner it should not be used. Again, rigid maintenance is the watchword once the plan is placed in effect.

Chapter X

THE CONTROL OF QUALITY IN INCENTIVE INSTALLATIONS

It is essential when developing the basis for an incentive installation that all factors be fully considered in the final development of the bonus performance standards and controls. In earlier incentive installations it was not uncommon to learn after the plan was in effect that sufficient controls over quality and waste were not included. When this was found to be the case the result often was that the gains in production were offset, or more than offset, by the increased spoilage and excessive material usage. In other words, the standards were developed so that the production element was overemphasized to the detriment of the quality or spoilage and material usage elements.

Therefore it is imperative that the spoilage, quality, and material usage factors be considered fully when making the analyses leading up to the development of the bonus standards and controls. If this is done we are in a position to determine the type and degree of control we wish to place over these factors on as accurate a basis as can be developed. Thus we not only keep all factors in balance and obtain a better incentive plan but we also avoid future problems and confusion that arise from an inadequate and faulty plan that must be changed or discontinued.

There are many different approaches to this problem of controlling quality and waste. They range from the nonfinancial controls to the point where these factors are the dominant ones in the incentive plan. For the purpose of illustration I have chosen to list some of the more representative types together with their more prominent features and the conditions under which they are most likely to be used.

Non-financial Type of Control

This type of control is most generally used when the operations are such that quality or waste is not a major problem. It may also be used in unusual cases where, although these factors are important, they are so difficult to measure, from a definite operation and responsibility viewpoint, that no attempt is made to make them a part of the incentive plan. In such cases these factors may play a prominent role in the supervisor's incentive plan, as discussed in Chapter IX.

These non-financial controls usually consist of posting the quality and usage performance record of each employee or group of employees on a competitive basis in each department; or some other such publicity device may be used. They also usually involve conducting educational and training programs on the value of the materials used and how to conserve them. Their obvious disadvantage is the burden they place upon the supervision to maintain satisfactory performances on these waste factors without the aid of a financial incentive.

Payment of Production Incentive Earnings on " Good " Production Only

This is perhaps the most universally applied of all the various controls placed over these factors. As indicated, it involves including in an employee's production count for incentive purposes only those parts or products that meet the specifications or inspection requirements and are acceptable at subsequent operations or as first-quality products. To include such a stipulation as this appears obvious and yet it has been overlooked upon occasion with most unsatisfactory results. It is often overlooked because it is easier to count the total pieces going through a machine than the " good " pieces coming from it.

This type of control is usually applied when the labor cost is clearly the dominant factor, with material costs either low or the danger of spoilage relatively low. Pattern or model making would be an example of this type of operation, al-

though there are many other regular production examples, such as where the material is readily reclaimable if it is spoiled with little loss other than the labor expended upon it up to that point.

Payment of Production Incentive Earnings on "Good" Production Only with Salvage Time Included as Work Time

This type of control is merely a more restrictive off-shoot of the preceding one. The additional provision is usually administered by adding the total salvage time to the total production time taken by the operator in producing the parts in question. In this way full credit is allowed for all production after it has been salvaged and passed by the inspection section. This control has a number of readily recognizable applications. They include machining, assembly, sorting and inspecting, cleaning, and like types of operations.

Payment of Incentive for Reduction of Waste or Conservation of Materials

This type of control is of greatest value in operations where the relative value of the material is high and the operator by his skill and attentiveness can keep both material usage and spoilage at a minimum. It might also be used where an operation definitely requires extra vigilance to prevent undue waste. In such instances it is highly desirable to place a direct financial incentive control over material usage and quality by making it a distinct contributing factor in the total incentive plan. This type of control finds its most common applications in those operations involving the fabricating of materials of comparatively high value.

This control can be developed in the following manner:

1. Establishment of limits of performance expectancy

On the basis of the careful analyses made of those factors that constitute material waste, limits of performance are established that will serve as the basis for the payment of bonus when they are met.

Two limits are first chosen, the average point and the normal

point. The average point is that one which should be met if the operator is qualified to perform the work and exercises average diligence. Therefore it is the break-even or 0 per cent bonus point. It is not necessarily the actual average based on past performance but may be, and probably is, a calculated figure.

The normal point is established at that level of waste performance which can be met or even exceeded by a qualified workman if he applies himself to a degree that can be considered normal. This level is well within the realms of practicability, but it does require that extra diligence which this qualified worker is capable of applying in order to attain it. Accordingly, he would be paid a bonus for exercising that above-average diligence.

2. Relationship between waste bonus factor and production bonus factor

Although both factors stand on their own feet insofar as their earnings determination is concerned, they do affect each other in the final calculation of an employee's bonus earnings. Earnings or losses on the waste factor are added to or subtracted from the earnings or losses on the production factor so that a net bonus is paid.

Although on a straight production bonus a worker can earn 25 per cent bonus by attaining that output designated as normal, he can under this type of dual plan attain only that portion of the 25 per cent bonus at that same rate of output that represents the weight given production in relation to the total weight. For example, if the analyses show that the incentive should be split equally between waste control and production, we should find each paying 12.5 per cent bonus at their normal performance levels. Thus, instead of the usual 25 per cent spread between average performance and normal performance, as in the case of single-control incentives, we here have a spread of 12.5 per cent. However, the two factors total 25 per cent at their respective normal levels.

3. Determination of relative weight given waste for bonus purposes

This is indeed a problem and it can be quite a controversial one. However, I know of no more accurate means of determining mathematically the per cent bonus weight that should be given waste than to use our best judgment after careful study of such cost statistics as the following:

A. Ratio of material cost to labor cost.

B. Waste savings that can be accomplished by improving cur-

rent performance so that it exceeds the past average waste percentage and equals the performance that has been designated as the break-even or 0 per cent bonus point (bonus average performance point), as compared with potential production savings.

C. Perhaps the most satisfactory basis is the ratio of waste savings between its designated bonus average and normal points and the production savings between its designated bonus average and normal points, excluding in both calculations the money that would be paid out as bonus.

An example of how this ratio would be determined is given below, using the same data as appear under item 5 following.

$$\text{Ratio of material cost to labor cost} = \frac{200{,}000}{4992} = 40.06$$

$$\text{Waste savings to break even} = \$4600.00$$

$$\text{Production savings to break even} = \$2496.00$$

$$\text{Production savings from average to normal (excl. bonus)} = \left(\$0.60 - \frac{0.60}{1.25}\right) \times 8320 \text{ hours} = \$976.40$$

$$\text{Waste savings from average to normal (excl. bonus)} = \$1000.00$$

Weight to waste 50% Weight to production 50%

4. Effect of production volume on waste bonus paid

There is one condition in this dual factor bonus basis that is often overlooked from a waste bonus viewpoint and that is the effect of production volume on waste bonus earned. Obviously it should require less diligence to earn the normal waste bonus at average production output than at normal production output, which is 25 per cent higher. There is less chance for something to go wrong. A worker, moreover, may choose this relatively easier method of earning a satisfactory bonus of as much as 12.5 per cent on the half-and-half weight factor basis we have assumed rather than to strive for a higher total bonus by increasing his production above break even.

Yet in doing so he does not perform to the same degree as does the operator who is endeavoring to achieve normal performance on the production factor as well as the waste factor. Nor is he contributing the savings from a waste standpoint at his average or break-even production performance, as is the individual producing at normal or 12.5 per cent bonus earnings performance. Consequently he is not entitled to the same return on his waste performance.

To illustrate further, let us assume that 100 pieces an hour is break even and 125 pieces is normal from a production standpoint. At break even then the worker earns 0 per cent bonus and at normal 12.5 per cent. Assume that 1.20 per cent waste is normal, for which 12.5 per cent bonus would be paid. Therefore, at the average production of 100 pieces he can earn 12.5 per cent waste bonus if he produces 98.8 good pieces. Yet the second worker, producing at normal or 125 pieces per hour, gets paid the same 12.5 per cent bonus for 123.5 good pieces. The higher cost that would prevail in the first instance is readily apparent, and it is against this contingency that corrective measures should be taken to encourage the worker to strive also for normal productivity or better.

Then, in order to compensate to a degree for waste performance at various levels of production, a volume factor should be developed that directly relates the amount of waste bonus paid to the amount of production bonus paid. This is accomplished by developing a standard hours to actual ratio at average production.

Let us remember our original premise, that for normal waste and normal production 25 per cent bonus is paid. Let us also remember that we are maintaining our same relationship between average and normal (1.00 average, 1.25 normal). Therefore our volume factor is determined by dividing the ratio between standard hours earned and actual hours expended by the normal bonus factor 1.25. For example, at average performance one standard hour is earned and one actual hour expended, giving us a ratio of 1.00. Then, to determine our volume factor with which to compensate our waste bonus earnings at average production performance, we divide 1.00 by 1.25, which gives us a volume factor of 0.80.

To illustrate further how this factor is used, let us assume a hypothetical case again in which 50 per cent weight is given to waste and 50 per cent weight is given to production.

Weight given waste	50%
Waste bonus at normal production and normal waste	12.5%
Waste bonus at average production and normal waste	10.0%
Weight given production	50%
Production bonus at normal production	12.5%
Production bonus at average production	0%

Waste bonus at average production equals waste bonus at normal production, modified by the volume factor explained above which was determined as follows:

Standard hours to actual hours ratio at average production = 1.00

1.00 ÷ 1.25 = .80 volume factor

Waste bonus at normal production and normal waste = 12.5%
Waste bonus at average production and normal waste = .80 × 12.5% = 10.0%

Using the same hypothetical case, let us assume further that:

1.70% waste = Established average
1.20% waste = Established normal

A waste bonus would then be determined according to the following scale showing its volume factor variances:

	Ratio Production Standard Hours to Actual Hours								
	0.90	0.95	1.00	1.05	1.10	1.15	1.20	1.25	1.30
W	Volume Factor								
A	0.72	0.76	0.80	0.84	0.88	0.92	0.96	1.00	1.04
S	Production Bonus								
T									
E	−5.0	−2.5	0.0	2.5	5.0	7.5	10.0	12.5	15.0
%	Waste Bonus								
1.10	10.8	11.4	12.0	12.6	13.2	13.8	14.4	15.0	15.6
1.15		10.5	11.0	11.5	12.1	12.6	13.2	13.8	14.3
Normal									
1.20			10.0	10.5	11.0	11.5	12.0	12.5	13.0
1.25			9.0	9.5	9.9	10.4	10.8	11.3	11.7
1.30	7.2	7.6	8.0	8.4	8.8	9.2	9.6	10.0	10.4
1.35	6.3	6.7	7.0	7.4	7.7	8.0	8.4	8.8	9.2
1.40	5.4	5.7	6.0	6.3	6.6	6.9	7.2	7.5	7.8
1.45	4.5	4.8	5.0	5.2	5.5	5.7	6.0	6.3	6.5
1.50	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0	5.2
1.55	2.7	2.8	3.0	3.1	3.3	3.4	3.6	3.8	3.9
1.60	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6
1.65	0.9	0.9	1.0	1.1	1.1	1.2	1.2	1.3	1.3
Average									
1.70	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.75	−0.9	−0.9	−1.0	−1.1	−1.1	−1.2	−1.2	−1.3	−1.3
1.80	−1.8	−1.9	−2.0	−2.2	−2.2	−2.3	−2.4	−2.5	−2.6
1.85	−2.7	−2.8	−3.0	−3.3	−3.3	−3.4	−3.6	−3.8	−3.9
1.90	−3.6	−3.8	−4.0	−4.4	−4.4	−4.6	−4.8	−5.0	−5.2

Daily calculation of total bonus can be simplified by combining production and waste bonus in the table by simple addition.

5. Example of condition under which this type of waste incentive would be applied

We should keep in mind that this incentive is designed primarily for operations showing high waste of a highly variable nature and requiring close attention on the part of the operator to control. Also savings resulting from this waste control will warrant paying a substantial bonus for that control.

An example of this condition is:

Material		*Labor*	
Material cost per year	$200,000.00	Labor cost per year	$4992.00
Value of 1% of material	2000.00	Preinstallation cost per standard hour	0.90
Value of 1% of waste	2000.00	Break-even cost per standard hour	0.60
Preinstallation % waste	4.00	Savings per standard hour @ B-E*	0.30
Established standard average waste %	1.70	Labor hours per year	8320
Established normal waste %	1.20	Savings per year @ B-E*	$2496.00

Saving per year preinstallation to average = (4.00–1.70) × $2000
= $4600.00

Gross savings per year average to normal = (1.70–1.20) × $2000
= $1000.00

Weight to waste	50%	Weight to production	50%
Waste bonus at normal waste and production	12.5%	Normal production bonus	12.5%

Waste bonus at normal waste and production = 12.5% × $4992
= $624.00

Net waste savings per year average to normal = $1000 − $624
= $376

Total material savings per year = $4600 + $376
= $4976 (potential)

* B-E = break even or 0 per cent bonus point

6. Essentials to the successful application of this plan

A. That waste savings above break-even bonus performance (average) at least equal waste bonus paid above break even.

B. That poor waste performance act as a penalty against production bonus earned.

C. That poor production performance act as a penalty against waste bonus earned.

D. That waste causes be readily determinable and definite responsibility be able to be fixed for them within reasonable limits.

PAYMENT OF INCENTIVE ON " GOOD " PRODUCTION ONLY WITH THE FAILURE TO MEET ESTABLISHED WASTE STANDARDS ACTING AS A PENALTY

This type of control would be used when the desire is to maintain satisfactory quality and waste performance as production increases under a direct production incentive. In this case the major emphasis is placed on output, but at the same time the value of the material is sufficiently high that a strong check must be placed on any carelessness that might adversely affect both quality and usage. Another instance of its use is in the manufacture of a bulk or quantity product where it is essential that a certain average quality specification be maintained.

The production standards and production bonus calculations remain the same for this type of control as are used by a single-control incentive when the sole emphasis is on production. However, in order to receive the full production bonus earned, definite spoilage or quality standards must be met. If they are not met, the production bonus is penalized accordingly. This penalty waste control requires the establishment of an average per cent waste, and a normal per cent waste, as discussed under the type of control immediately preceding this particular discussion. The determination of the relative weight to be given waste and production would also be made in the same manner as discussed under the same previous control.

Ordinarily this control does not compensate for any material savings that might be gained through meeting the established standards when they are more exacting than past performance. Its maximum penalty is usually the cancellation of all production bonus for that day. Should there be any penalty still remaining after that has been done it is canceled. It is of further note that in this type of control consideration is seldom given to a volume factor such as we

discussed previously. The reason for this is that production, not waste, is emphasized.

Again, if 1.70 per cent is used as average and 1.20 per cent as normal waste performance, the bonus chart for this type of control would appear as shown in the table on page 141.

To summarize, this type of control would be used where material cost ratios may be high, but the waste performance is near normal so that little would be gained by the application of a direct waste incentive as previously discussed. At the same time the situation is such that large losses might result if waste increased materially along with production. An example of a condition under which this type of incentive might be applied is:

Material		*Labor*	
Material cost per year	$200,000.00	Labor cost per year	$4992.00
Value of 1% material	2000.00	Preinstallation cost per standard hour	0.90
Value of 1% waste	2000.00	Break-even cost per standard hour	0.60
Preinstallation % waste	1.30	Savings per standard hour @ B-E*	0.30
Established average % waste	1.70	Labor hours per year	8320
Established normal % waste	1.20	Savings per year @ B-E*	$2496.00

Savings per year — preinstallation to normal = (1.30 − 1.20) × $2000
= $200.00 or 8.01% of production saving

* B-E = Break even or 0% bonus

Conclusion

One of the more common objections raised, usually by the supervision, against developing an incentive plan for a department is that it might hurt the quality of the product. That is a legitimate objection because that can be the result if the quality and material usage factors are not carefully analyzed and fully considered in developing the basis for the proposed incentive plan. In the past this consideration was not always given, with adverse results. Yet competent engineers know that adequate protection can be given

WASTE BONUS CONTROL CHART — PENALTY FACTOR

% Waste	% Production Bonus Penalty	Ratio Production Standard Hours to Actual Hours								
		0.90	0.95	1.00	1.05	1.10	1.15	1.20	1.25	1.30
		% Production Bonus								
		−10.0	−5.0	0.0	5.0	10.0	15.0	20.0	25.0	30.0
		Net Bonus %								
1.00	0.0	−10.0	−5.0	0.0	5.0	10.0	15.0	20.0	25.0	30.0
1.04	0.0	−10.0	−5.0	0.0	5.0	10.0	15.0	20.0	25.0	30.0
1.08	0.0	−10.0	−5.0	0.0	5.0	10.0	15.0	20.0	25.0	30.0
1.12	0.0	−10.0	−5.0	0.0	5.0	10.0	15.0	20.0	25.0	30.0
1.16	0.0	−10.0	−5.0	0.0	5.0	10.0	15.0	20.0	25.0	30.0
Normal										
1.20	0.0	−10.0	−5.0	0.0	5.0	10.0	15.0	20.0	25.0	30.0
1.24	−1.0	−10.0	−5.0	0.0	4.0	9.0	14.0	19.0	24.0	29.0
1.28	−2.0	−10.0	−5.0	0.0	3.0	8.0	13.0	18.0	23.0	28.0
1.32	−3.0	−10.0	−5.0	0.0	2.0	7.0	12.0	17.0	22.0	27.0
1.36	−4.0	−10.0	−5.0	0.0	1.0	6.0	11.0	16.0	21.0	26.0
1.40	−5.0	−10.0	−5.0	0.0	0.0	5.0	10.0	15.0	20.0	25.0
1.44	−6.0	−10.0	−5.0	0.0	0.0	4.0	9.0	14.0	19.0	24.0
1.48	−7.0	−10.0	−5.0	0.0	0.0	3.0	8.0	13.0	18.0	23.0
1.52	−8.0	−10.0	−5.0	0.0	0.0	2.0	7.0	12.0	17.0	22.0
1.56	−9.0	−10.0	−5.0	0.0	0.0	1.0	6.0	11.0	16.0	21.0
1.60	−10.0	−10.0	−5.0	0.0	0.0	0.0	5.0	10.0	15.0	20.0
1.64	−11.0	−10.0	−5.0	0.0	0.0	0.0	4.0	9.0	14.0	19.0
1.68	−12.0	−10.0	−5.0	0.0	0.0	0.0	3.0	8.0	13.0	18.0
Average										
1.70	−12.5	−10.0	−5.0	0.0	0.0	0.0	2.5	7.5	12.5	17.5
1.72	−13.0	−10.0	−5.0	0.0	0.0	0.0	2.0	7.0	12.0	17.0
1.76	−14.0	−10.0	−5.0	0.0	0.0	0.0	1.0	6.0	11.0	16.0
1.80	−15.0	−10.0	−5.0	0.0	0.0	0.0	0.0	5.0	10.0	15.0
1.84	Can-	−10.0	−5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.88	cel	−10.0	−5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.92	All	−10.0	−5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.96	bonus	−10.0	−5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2.00		−10.0	−5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Waste penalty is not applied when production bonus is 0.0% or lower.
Waste performance below a certain percentage cancels all bonus.
Waste penalty does not penalize production bonus to below 0% net bonus.

both quality and material usage in the development of a wage incentive plan. I hope that, by this brief discussion of this problem, I have not only emphasized the importance of these factors in an incentive plan but have also indicated possible solutions that will provide the basis for satisfactory answers to a particular problem.

Chapter XI

TYPICAL INCENTIVE INSTALLATIONS

In the preceding chapters I have discussed principles and policies that should serve as the bases for wage incentive plans as well as govern their installation and operation. It is my intent in this chapter to review some of the problems and factors involved in tailoring these principles and policies into suitable, successful incentive plans. In doing so I shall use as examples several of the typical types of operations found in most industrial plants.

Factors That Affect the Development of an Incentive Plan

In the development of a plan for any given operation there are certain factors or components that should be weighed and considered in determining whether or not they are factors in that particular operation, and, if they are, the degree to which they affect the total cost of the operation. Once this has been done, it then becomes the problem of the engineer to develop ways and means of establishing the proper control over each factor or component in the development of the standards and the plan for that operation. These factors are:

1. Material utilization and spoilage

This concerns the amount, value, and kind of material that should be used per unit of product plus the percentage of spoilage that must be considered as normal or expected for that process or operation.

2. Quality

What is the standard acceptable quality established for that operation? What are the difficulties involved in maintaining that standard? What are the cost results if not maintained?

3. Machine utilization

What is the maximum machine utilization we can expect after establishing the proper methods and standards for making set-ups

and loading the machine? This involves determining proper feeds and speeds for each machine and type of use.

4. Man power utilization

To what degree are the time and energy of the operator utilized in relation to what would be considered normal utilization? What is the nature of the waiting time involved? Can additional work be assigned to reduce or eliminate the otherwise unavoidable waiting time?

5. Tool and equipment usage and maintenance

What is determined to be the normal tool usage and breakage in the performance of the work involved? What damage can be done to the equipment by overloading and the like?

It is essential that the engineer give careful thought and attention to each of the above factors in developing his plan. Although every effort should be made to keep the final plan as simple as possible, its success or failure depends to a large degree on the development of the proper balance between the various cost factors involved.

Limitations on the Use of Incentive Plans

An incentive plan can be developed for any operation or service in a plant. The limitations faced in developing incentive applications are those of the engineer's ability and ingenuity in developing proper standards and in establishing relatively simple means of obtaining accurate production counts. These limitations are real and will vary in degree between plants and industries. Yet the engineer must be constantly seeking ways and means of overcoming these obstacles in order to obtain maximum incentive coverage.

The Fundamental Nature of All Work from an Incentive Standpoint

For purposes of this discussion we can consider that all work falls into one of two natural categories. The first is manual work, including working with hand tools or hand-controlled tools; the second is machine-controlled or machine-paced work.

The opinions of engineers will vary as to which is the more

difficult type for which to develop incentives. It is usually more difficult to determine how much work a job contains when it is hand paced, but the engineer, when studying such operations, is not ordinarily faced with the problem of proper total utilization of a man's time as he is in most machine-paced operations.

An exception to this statement is gang work. There the problem is one of organizing the work so as to achieve the best balance possible among the various members of the gang or group with a minimum of waiting time for each and all members.

Machine-Paced Production Operations

As indicated above, the major problem in machine-paced operations is maximum utilization of both machine and manpower. In studying such an operation the engineer is confronted with the fundamental problems of:

1. Establishing the proper feeds and speeds at which the machines should operate on all the classes of work placed upon it.
2. Developing standard set-up and tear-down methods with proper time standards governing them, these to be a part of the incentive installation to encourage a minimum time being consumed on such non-productive work.
3. Establishing proper methods and standards for loading and unloading parts or material on and from the machine.
4. Determining the true need for the operator's close attention during the time the machine is working.

On the bases of these determinations the engineer can establish standards which will insure maximum machine utilization insofar as it is deemed obtainable at that time. He will furthermore have determined the amount of free waiting time the operator has available. By free waiting time is meant that time the operator could devote to other work within the immediate vicinity of his machine without running

too great a risk of harming either the machine or the quality of the work in question.

If no effort is made to utilize this free waiting time to keep it at a minimum, it is obvious that inequities will arise between jobs having this free waiting time and those not having it. This may lead to discontent on the part of employees not so fortunate as to have this waiting time as an integral part of their job. It is not unusual in machine-paced operations for the operator to find that he spends the majority of his time waiting for the machine to complete its work. Of course he may be required to break up this idle time by gauging or otherwise testing the work being done at regular intervals. However, he does have idle time that can be utilized in performing other work. Ways and means must be found to make use of this time in order to eliminate inequities between jobs and to eliminate the waste of skilled labor.

Maximum Utilization of Man Power in Machine-Paced Operations. This can be accomplished in a number of ways, among the more common of which are:

1. Plan and prepare machine layouts so that an employee can operate more than one machine

By carefully grouping machines into batteries of two or more units, the operator is often able to run them all successfully with a minimum of machine down time. Obviously such an arrangement must be worked out with great care so that the machines are grouped in a manner that not only requires a minimum of movement on the part of the operator but also permits ease in handling work in and out of the machines.

The type of work that goes over the machines, the length of their operating cycles, and the degree of close attention they require are all important factors in determining the final layout. Although the machines in the group may be of the same type, it is not a requirement. The important and controlling point is the degree of machine and man utilization that can be achieved without harming the quality of the work or increasing spoilage and material waste.

2. Provide inspection and gauging work

Another common device in obtaining proper man power utilization is to provide suitable tools and work place that will permit

the operator to inspect, fit, or gauge parts either completed or in process. The amount of such work he can do will depend upon the requirements of his primary job at any given time. Standards should be developed for this secondary work and the output included in the operator's regular incentive calculations.

3. Hand forming or assembling

Again by providing proper tools and work place the operator may engage in performing hand-forming operations or making small assemblies. The work should be so organized that it will not take him away from his primary operation to a degree that might harm the work being performed or the machine itself. Standards should be developed for this secondary work so that it can be included in the operator's total incentive calculations.

4. Repair and salvage work

Another relatively common method of solving this problem is to provide the operator with additional work of a repair or salvage nature. This type of work may not lend itself as readily to the application of standards for incentive purposes as work of a straight production nature. Nevertheless, satisfactory standards can be developed in the majority of instances, and this type of work then becomes a satisfactory secondary operation.

It is well to repeat that one of the most difficult determinations to make under such a situation is the amount of close direct attention the machine requires while it is performing its function. The answer in many cases depends on how modern the particular equipment is as to design and controls. As machine design has improved, the degree of the operator's attention required often has decreased because of the protective and safety devices built into the machine that reduce the amount of close observance required. The supervision of the department, as well as the operators, can be of real aid in determining just what these requirements are.

Manual Production Operations

In manual or hand operations the chief problem is proper organization of the work and the establishment of equitable standards and controls. Of the five incentive factors mentioned at the beginning of this chapter, four are important in manual operations. Machine utilization is the one that in

many cases is not of major importance. Tool and equipment usage and maintenance can be an important factor where hand tools of some value are used or where hand-controlled or hand-operated equipment is involved.

The chief consideration then is to achieve the proper balance between production output, quality, material usage, and spoilage in developing the standards. The importance and problems of proper organization of work, work measurement, control over quality, and material usage have been discussed in preceding chapters and need not be repeated here.

Service Operations

By service operations are meant transportation, cleaning, servicing, and the like. In the past these operations have been often overlooked from an incentive viewpoint since the controls and methods required to obtain output measurements on them are not as apparent or easily developed as in direct operations. Yet it is important that every effort be made to include them in the plant incentive installation, not only to reduce cost but also to keep the number of non-incentive jobs at a minimum. By doing so the inequities in earnings between incentive and non-incentive workers are reduced.

These inequities in earnings not only are a source of grievance on the part of the non-incentive employees but they also tend to make the jobs in question less desirable. Therefore they are harder to fill, and it is always more difficult to keep people on them. In the past, in order to overcome these inequities, it was not an uncommon practice to place such workers on incentive by the mere device of giving them the average incentive earnings of the group they served. Many times this was done arbitrarily with no positive control over the quality or quantity of the work they performed or the total activity of the group they served. Under such circumstances this was *decidedly bad practice.*

Yet as mechanization of industry becomes more and more advanced, the ratio of such indirect labor to direct labor is

constantly increasing. Therefore it is of growing importance that ways and means be found to place such operations on incentive. Whenever possible such incentives should be of a direct nature, that is, should have a basis in the actual productivity of the function in question rather than some basis involving the performance of others they may affect to some degree.

When an intensive effort is made to find some productive unit of measurement that is obtainable in an economical manner, the ease with which this can be worked out is often surprising. It is largely a matter of ingenuity in taking advantage of controls and production counts already required and established by production operations, along with area and distance measurements.

Types of Service Operations and Problems Involved in Placing Them on Incentive. For the purpose of illustration we shall discuss several representative problems involving service or indirect labor.

1. Material handling or transportation

The basic factors involved in material handling or transportation are:

A. Type and nature of material.
B. Weight and bulk of material.
C. Method and means of transportation.
D. Distance traveled.
E. Conditions surrounding and controlling loading and unloading operations.

It is these factors that determine and control the type of incentive plan that can be developed for material handling operations as well as the methods of work and the standards governing them. Owing to the variable nature of the work involved, the standards governing these operations are usually developed in tabular form by like elements. For example, there are three distinct general basic elements involved in these operations. They are load, travel, and unload. Each one of these basic elements is a variable within itself, and all the possibilities must be covered in developing the standards for it.

The trucker may be called upon to load and unload a variety of materials or parts. Each must be covered by a standard. Each

may have its standard developed by time allowed per unit or units of material loaded or unloaded. Distance traveled is an obvious variable with feet or some other linear measurement as the unit upon which the standard is developed. However, there are other variables in that the type of floor or roadway affects the time required as well as interferences encountered en route. For example, it would be one thing for an overhead craneman to transport a magnet load of castings three hundred feet on a straight run with no obstruction or unusual safety factors in the way, and quite another if he had to thread his way carefully down the floor, moving his load back and forth in such manner as not to endanger any men working under the path of his crane.

Other examples come readily to mind, such as the use of elevators, opening and closing doors, making safety stops, and the like. The important point is that each possibility must be covered by standards, and ways and means developed to make the proper allowances for all work done and all variables encountered. This will permit the clerk responsible for calculating the incentive results at the end of a day to reconstruct the work done by referring to relatively simple records, and by using time data tables to make the proper time allowances.

Transportation is usually of two general types, which are handled differently insofar as controls and production counts are concerned. The following is a brief discussion of each one.

A. The Servicing of a Definite Group of Machines or Operations. This involves the determination of logical groups to be served and the number of truckers, cranemen, or other service help required to supply them properly at their normal output. In this manner the first control is applied in that the proper service help is specified.

Standards have already been developed covering the various types of materials and parts involved. The problem now is to obtain proper production counts. Many times these can be obtained by using the production records of the direct workers serviced. For example, if a direct worker produces one thousand parts, obviously someone had to bring the material to him and take the parts away. If the source of the materials can be located readily, and within definite known areas as well as the points of disposal, the problem of reconstructing the work done is not too difficult. Often it is necessary to provide the trucker with a properly designed form upon which he can record points of disposal and the like. This record can also serve as a means for noting unusual or non-repetitive operations which he is required to do and for which allowances are made as they occur.

When the problem of placing such service workers on direct standards is too complex from a recording standpoint, they can be considered a member of the group they service. However, as indicated earlier, they must not be attached to a group without any control placed over them. In such instances the number of operators a man can service must be carefully determined and established as standard. Then he can participate on the basis of the average earnings of the operators he services on the theory that he can aid their production results by providing them with prompt efficient service.

In the event that the number of operators serviced drops below the standard number, the service man's participation should be affected in direct proportion to the activity of his group. For example, if the normal number of operators serviced is four and only three are involved, the service man would participate on the basis of 75 per cent of his full participation basis.

B. Transportation of a General Nature. This type would involve the general plant transportation unit. Ordinarily, such work is scheduled by a chief dispatcher, and it is his order sheets, plus the record kept by the trucker, that serve as the basis for determining the work done. Then by the use of time data tables and distance charts the clerk can reconstruct the work done and make the proper allowances.

Obviously there are more variables under such a set-up as this in comparison with operating in a restricted area and handling a comparatively limited group of materials or parts. However, these variables can be covered and such operations placed on incentive successfully. The degree of accuracy obtainable may leave something to be desired, but if sufficient time and thought are devoted to the problem it can be solved in an acceptable manner.

2. Cleaning and janitor work

Such work as sweeping, scrubbing, window washing, and the like have a common unit of measure in area cleaned. In addition to area, there are other variables such as nature and condition of the surface to be cleaned, kind of equipment used, materials used, and the accessibility of the surface together with obstructions to be overcome.

Similar time data tables as discussed under transportation can be developed to cover these variables in a manner that will keep the incentive accounting procedures sufficiently simple. Work accomplished can be recorded by the supervisor of the group as

he assigns the various tasks and inspects the quality of the completed work.

The opportunities for cost reduction through specifying proper tools and equipment as well as methods of work should not be overlooked. Operations such as these lend themselves to such studies just as readily as do straight production operations with just as satisfactory results.

Inspection

There are strong differences of opinion as to whether or not inspection operations should be placed on incentive. However, as additional experience is gained with inspection incentives the trend is toward placing such operations on incentive. The obvious basis for these objections is that an incentive might encourage the inspectors to slight their work in order to increase their earnings and thus harm the quality of the product. It is true that an improperly developed incentive plan might do that very thing. Yet it is desirable to extend an incentive plan to include inspectors if a satisfactory basis can be worked out. To be successful tends to eliminate inequities in earnings between incentive and non-incentive workers and at the same time establishes proper controls over an important group of operations.

The Problem of Developing Inspection Incentives. Since the primary function of an inspection operation is to detect and remove defective or inferior parts, products, or materials, it is essential that this point be emphasized in the development of the incentive plan. At the same time it is important that quality of output not be overlooked as inspection costs must be kept in line the same as all other costs. The goal to be sought is to achieve a balance between quantity of output and quality of inspection that lends the proper emphasis to both. For purposes of discussion let us separate the inspection function into two groups — work in process inspection and final inspection.

1. Work in process inspection

This type of inspection is placed at specific points in the manufacturing process to check quality and specification of the work

performed up to that point. The purpose of this inspection is to prevent additional work's being done on a product that is not up to specification. In this type of inspection incentive, greater emphasis can be placed on productivity than otherwise since other inspections will follow. Thus the possibility of placing such operations on a production incentive, with severe penalties for defective or substandard work found at subsequent operations that should have been caught at this point, should be investigated.

Excessive earnings under these conditions are an immediate danger signal that calls for an investigation to determine if the work is being slighted. Although it must be recognized that there will be exceptional inspectors, just as there are exceptional workers in any line, a positive and immediate check must be made of any performance that appears unusual. This check is only to insure proper performance and should not be construed as a device either to limit earnings or to lead the inspectors themselves to place a ceiling on their earnings.

It must be recognized further that the general quality of the work being inspected will influence heavily the production performance of the inspectors. Should there be wide swings in the general quality of the work being inspected, then it may be necessary to establish different standards to govern the different distinguishable general quality grades encountered. Furthermore, if found advisable, a system of check inspection could be set up for this type of operation on the same general bases as we shall discuss in the next section.

2. Final inspection

The problems involved in establishing incentives for final inspection operations differ from those of work in process inspections in that these workmen are the last link between the production organization and the customer. Therefore the quality factor looms much more important in their total incentive picture. Usually there are three major factors considered in establishing an incentive for final inspection operations. They are productivity, percentage of good product found set aside as bad, and percentage of bad product passed as good. The weight given each depends entirely upon the nature and value of the product, its end use, and the tolerances permissible.

The problem of developing proper standards for productivity follows the same pattern as discussed under "Work in Process Inspection." The problem of maintaining quality of inspection usually involves the use of check or sample inspection. This includes establishing sample lot sizes determined by statistical

methods and proved by actual test. When used as the basis for the check inspection these sample lot sizes provide an accurate picture of the quality of the work performed. Thus all work performed by the final inspector is submitted to a check inspection before it is released. For example, it might be found that a 33⅓ per cent check inspection of the product set aside as defective gives an accurate picture of the soundness of the inspector's judgment in that respect. It may further be found that a 5 per cent check inspection of all product passed as good provides an accurate picture of the inspector's judgment in that respect.

By establishing the proper balance between these factors of productivity and accuracy, and by developing control scales showing both gains and penalties under each, a sound incentive plan can be developed.

Maintenance Work

This is another field of endeavor that has proved quite controversial as to the practicability and economics of developing incentives for it of a direct nature. Yet those who have set about in a determined manner to develop direct incentive plans for their maintenance workers have found that it can be done successfully and with excellent results both from cost reduction and increased earnings standpoints.

Two Types of Maintenance Work from an Incentive Standpoint. Maintenance work generally falls into two classifications: routine inspection and preventive maintenance and repair work.

1. Routine inspection plus preventive maintenance

In most plants there are certain members of the maintenance crew permanently assigned the duties of making regular rounds looking after various types of equipment. This work may include oiling motors and equipment and inspecting electrical connections and wiring, motors, beltings and chains, and a host of other like duties. It may also involve making minor repairs or temporary emergency repairs when necessary. It is customary to provide each worker with check sheets governing the work tour he is required to make. On these sheets he either checks the proper information or makes a record of the condition of the equipment in question, also noting any repair work done on such equipment during that tour.

Thus the pattern or basis for the incentive plan and its direct

standards becomes apparent. The standards must be built in tabular form that will permit the bonus clerk to reconstruct the work done and apply the proper standards. Although obviously considerable confidence must be placed in the integrity of the worker under such a plan, it has been found that this confidence is seldom misplaced. Furthermore supervision can check on the quality of the work done. In addition to this check, the performance and repair records of the equipment provide the data for the final test of the quality and effectiveness of the inspection and preventive maintenance work performed. It is also possible to develop penalty factors on such bases as these, but it is not usually necessary or desirable to do so.

2. Repair operations

This type of maintenance work usually involves the overhauling and repairing of machinery, motors, and equipment as well as building maintenance and repair. The degree of the repair may vary but it usually follows a set pattern of tearing down the equipment, overhauling it, and reassembling it. In building maintenance it is usually a matter of replacement, repair, or painting. This work may be done either in the maintenance shops or at the location of the equipment or building. In either case direct standards can be established accurately and adequately if sufficient time, thought, and energy are applied to the task.

The important point again is to construct the time data and standards in such a manner that they permit not only the proper recording of the work actually done but also the application of the proper standards. There are certain to be many variables that must be considered, but they can be solved and controlled with most satisfactory results. Maintenance incentives on any other basis than direct standards are usually so loose and vague from a control standpoint that they should be subjected to a careful study before they are given serious consideration.

Conclusion

As stated at the beginning of this chapter, it was my intention to discuss briefly some of the problems involved in making various types of wage incentive installations together with suggested approaches to the solutions of those problems. I further intended to emphasize the importance of devoting sufficient time, as well as thought and energy, to the solution of the problems of developing a strong wage incentive plan.

If the plan is to be successful every factor affecting the operation or operations involved must be fully weighed and considered. This thoroughness need not complicate the plan unduly as ways and means can be found to compensate for each factor in a relatively simple manner.

Chapter XII

UNION PARTICIPATION

A major change which has entered the industrial picture during the past few years is the trend toward union participation in fields of industrial management heretofore considered to be exclusively the province of the managers of the business. This condition represents another milestone or even a major directional turn in the course of our industrial progress. Its full potentialities are as yet only guessed. If properly controlled and guided it can prove to be one of the dynamic forces back of our next great industrial surge forward. If uncontrolled or improperly used it can disorganize and disunite the combined efforts of all who are interested in furthering our industrial system to the point where irreparable damage is done.

Fundamental Bases Underlying and Affecting This Trend in Union-Management Relationships

It is well to examine briefly some of the conditions and bases surrounding this new phase or era in our industrial commonwealth.[1] There are certain fundamental truisms long recognized that form a sound acceptable basis for this participation. One is the fact that a cooperative effort has a much greater chance for success than does one that is not cooperative. Another is that removing the shackles of fear and un-

[1] A comprehensive study of this whole problem is ably presented and discussed in *Management, Labor and Technological Change* by John W. Riegel, director of the Bureau of Industrial Relations at the University of Michigan. This work presents the findings of the survey made by the Bureau of Industrial Relations and should be studied by everyone interested in this problem. This book, published in 1942 by the University of Michigan Press, gives a clear picture of the bases, complexities, and possible solutions of this problem as it exists today.

certainty from a man's mind usually results in providing a willing, open-minded partner to our plans.

Even before the period when the doors of industry were opened wide to the organized labor movement, the practice of making a company's employees partners to a degree in the plans of the company that directly affected them was being advocated and followed sufficiently to prove the soundness of that approach to the particular problems in question. The rapid growth of labor unions plus the militant demands of their leadership for such participation have sharply accelerated the practice of this relationship. To my mind there can be no question of the desirability of making the hourly employees in the plant limited partners in reaching decisions on affairs that directly affect their jobs. This to be regardless of whether or not they are formally organized into a labor union.

The scope of this partnership and the responsibilities entailed depend entirely on the circumstances and conditions surrounding any given situation. The fact that the employees are members of a labor union in no way changes the fundamental soundness of this relationship. It does, however, inject new conditions into the situation which may materially alter the degree and even the desirability of such a practice.

Fundamental Concepts Necessary for Successful Employee Participation

The answer to this whole problem of employee participation, in the solution of problems that directly affect them, depends wholly on the sincerity, integrity, and enlightened intelligence of two groups of individuals — the members of management and the union leaders.

The Management. If the management group is composed of individuals typical of a bygone day who look upon the idea of open discussion and solution of common problems by management and labor as akin to consorting with the devil, or as sacrificing some of their " divine rights " as managers, then

the experiment is doomed to failure. If they are men who feel that the cloak of their office includes a large portion of omnipotent wisdom that makes their ideas and opinions unassailable, then it is far better that the institution of this relationship never be attempted.

If they are men who recognize that such relationships are a definite step forward on the path of industrial progress, then there is real hope for success from the viewpoint of management's attitude. If they recognize that for any plan, whether it is an incentive plan, new plant layout, method of work, or what have you, to achieve its full measure of acceptance and success it must be understood and believed in by the hourly employee, then they are mentally ready for this relationship.

If they recognize and act on the fact that they must do everything they can to eliminate mystery, fear, and insecurity from those acts that directly affect and concern their hourly employees, then they are blessed with the concept that makes for success in this partnership. If they recognize the value that lies in the ideas and thoughts that exist in the minds of their employees and seek them, they will do all they can to make this partnership work.

The Union Leaders. If the union leaders are still possessed of the idea they fostered and believed during their picket line days, that management, and all it stands for, is their natural enemy, then a sound basis for this relationship is totally lacking. If they see their power as union leaders only as a predatory device to wring from industry all that can be obtained regardless of consequence or value given in return, then they are to be fought, not accepted.

If they belong to that school that looks upon sound management practices, such as rate structures, incentives, and methods improvements, only as devices to attain stability of industrial relations and believes that stability would only lessen its personal power and is therefore undesirable, then they lack the proper concept of their positions. If they belong to that school among union leaders that thinks its objective

should be to share equally the authority of management, but accept none of its responsibilities, then they are to be shunned.

If, on the other hand, they are labor statesmen who recognize the rights of management and capital as well as the rights of labor, then they are mentally and emotionally ready for such a relationship. If they believe in the premise that the future of our country lies in the furtherance of our industrial system and that, whereas labor must have its full share of the benefits of this system, it must also accept its full responsibility in aiding the advancement and development of industry, then they are welcome partners in solving these problems.

Therefore, before such a relationship can advance beyond the discussion stage, there must exist a mutuality of interest between the two parties involved. This interest must be clearly defined and understood by all concerned, with both groups determined to reach equitable and satisfactory conclusions.

Development of a Basis for Participation

In establishing a basis for union participation in the development and institution of such projects as a wage incentive system, there are certain fundamental concepts of responsibility and authority that must underlie this relationship. These are in addition to the mutuality of interest and other personal attitudes, concepts, and policies of both management and labor we have just discussed. These concepts are not affected by the degree of participation which, as we shall point out, can and will vary widely. They are:

1. The final power of decision must rest with management

Management is hired by the owners of the business to operate it for them. In effect they then become the owners of the business. Management, if it is successful, must protect and foster the interest of both the employees and the owners of the business. In the long run the two are inseparable from an interest and economic survival standpoint. If one is favored over the other to any degree, for any period of time, the enterprise is certain to suffer to the detriment of both groups.

Therefore the final power of decision even as to whether or not the project should be continued, must rest with management. They alone are held responsible for the ultimate success of the business with the penalty of removal if they fail. They alone can and should be in possession of all the facts, in a corporate sense, of the business, and with that full knowledge are in the better position to make that final decision.

Should the union representatives disagree with management, they must not possess the power of veto or decision. Formal grievance procedures should be set up to provide labor with a full hearing. This may include in some cases the calling in of an outside specialist to review the data and give an opinion. However, in no sense should this be construed as arbitration. It must remain management's inalienable right to have that final power of decision as to what shall or shall not be done insofar as technological change is concerned. Of course there would be nothing to prevent the union members withdrawing from a joint study project in which they were limited partners should they decide that was the thing to do from their standpoint.

Where mutuality of interest exists to the proper degree and both parties have given full and fair consideration to the case in point, there will be few times that any such action on the part of management or labor will be necessary. Nevertheless, that is why I stated earlier in this chapter that the partnership has certain definite limitations.

2. Policies governing the work of the participants must be clearly stated before any work is done

This involves not only such policies as are discussed in Chapter II but also policies governing the manner in which the work will be conducted. Careful thought should be given to these policies to make them as complete and comprehensive as possible. At the same time care must be taken to avoid commitments that may not be possible to keep. It is wise to adopt a conservative position in this respect so that it will be possible to do more than stated rather than less. Where doubts exist as to what may be done in the future, these doubts should be clearly stated with reasons given for the uncertainty of the forecast action.

3. A standard must be based only upon facts and changed only by facts

Work standards must be based upon facts determined by careful and complete analysis. They must represent the best judgment of the ablest technicians available. These individuals must

not be subjected to pressures from any source that could be interpreted as attempts to influence their decisions in favor of one party or another.

Standards may be questioned only to the degree that further analysis is desirable either to support the standard or to provide the basis for making a change. If such an analysis supports the standard, it must remain unchanged. To permit a standard to be changed arbitrarily because of pressure exerted by a group is to destroy the integrity of all standards and to cause them to be subjects of mistrust. Thus is destroyed the true foundation of the plan in question. Therefore standards must not be subjected to negotiation or arbitration either in their establishment or in their change.

4. The fundamental reasons for making the study should be fully stated

That this should be done is important in that it provides further protection against future misunderstandings. These reasons may be due to the company's poor earning record, the type of wage plan in use not being satisfactory, an effort to provide more stable employment, the elimination of waste to provide more money for the payment of increased wages, the competitive position of the company, and the like.

Here again the degree and detail of the discussion depend upon the nature of the reasons, the degree it affects the hourly employee, and the stage of development the practice of participation has reached in the plant. At this time the goals or objectives of the study are clearly defined and established. The program outlining the step-by-step progression towards these goals should be drawn up and agreed upon by all parties concerned. This not only will save time through proper planning of the work but will also tend to eliminate future misunderstandings as to scope and the like.

Variations in the Degree of Participation

Obviously there can be no single plan or pattern for such participation even within a single plant, let alone in more than one plant. There are many types and degrees of technological changes and related projects, and they vary widely as to seriousness and difficulty. All of this means that they justify different administrative policies and procedures as regards their effect on the employees and union participation in their solution.

The degree of participation may vary from a purely advisory and interested position to that of representatives of the employees working full time with the technicians in the effort to reach satisfactory solutions to the problems. Again this degree of participation depends on whether or not it is a major or minor change. It could be said that there are two general types of studies that would involve union participation. They might be termed "regular" and "special." By "regular" is meant, for example, the normal or routine maintenance of a wage incentive plan or its extension to other operations in the same department. By "special" is meant a new or major project such as the relayout of a department, the development of new works methods, the institution of, or major revamping of, a wage incentive plan, or the like.

Each type probably would be handled differently insofar as union participation is concerned. Again the degree of participation would depend upon the employees' measure of interest in participating beyond a "being kept informed point," and also upon the degree of maturity and confidence reached in this relationship between management and labor.

Employee Participation in Special or Major Technological Change Projects. For the purpose of illustration let us assume that we are going to work with one department at a time rather than take the plant as a whole in one project. Then our overall program would take the following general form with both degrees of participation discussed.

1. General or preliminary managerial discussions

A. Discuss Thoroughly with the Plant Management and the Department Head and His Assistants the Objectives of the Study.

B. Develop Detailed Program Governing Work to Be Done in the Department. To be acceptable it must bear the approval of the department head in addition to the plant management and the industrial engineers.

C. Prepare in Detail the Approach to the Employees of the Department and Determine Fully the Degree of Employee or Union Participation It Is Deemed Wise and Desirable to Encourage at This Time.

2. Program when employees are participating on an advisory basis and are kept fully informed of what has been done and what is going to be done

A. Meet with All Employees in the Department to Discuss Fully the Objectives of the Study and How It Is Going to Be Conducted. This meeting should include a thorough discussion of the advantages to both labor and management that should result from the study. The policies under which the project will be carried forward should be carefully explained and the required assurances regarding the full protection of the employees under the study given in a clear concise manner.

The techniques and methods to be employed should be explained by the use of examples, motion pictures, charts, and the like. The employees should also be given to understand that their advice and counsel not only are desired but are also sought.

If it is so desired by the union officers and committee, this whole program can be discussed with them alone before it is presented to all the employees. Under most circumstances this would be a desirable course to take and should be looked upon favorably by management.

B. Meet Periodically with the Employees as the Study Progresses. As progress is made and each phase of the program is completed, similar meetings should be held with all the employees to explain and discuss the results obtained. At this time the next step or phase should be fully discussed so that the employees are completely aware of what is planned.

Special effort should be made during these meetings to overcome any skepticism on the part of the employees. At the same time they should be encouraged to express any doubts or ask any questions they may have not only about the details of the study but also as to how it may affect them. This is the time to remove any doubts and fears that may still exist in the minds of the workers. These meetings should be conducted by the departmental supervision, assisted by the engineers.

C. Have Regular Daily Contacts with Departmental Employees. As the engineers carry on their work in the department, they should talk it over with the employees they are working with and give full explanations of what they are seeking at that particular moment, and they should ask the advice of the workers. The departmental supervision should aid in these contacts, especially so if it is the first contact with a particular group. It is by means of these day-to-day contacts that most of the misunderstandings, rumors, and misapprehensions can be cleared up. In fact it is not too much of an exaggeration to say that the success or failure

of the entire project rests upon the success of the daily contacts between supervision, engineers, and the hourly employees.

D. Hold Meetings at the Conclusion of the Program. Meetings have been held as each phase of the program was completed, and the changes and improvements are now made and installed. When these changes have been completed and the employees fully trained in the new methods of work, the next move is the installation of the incentive plan. Regardless of whether or not the employees are generally familiar with the type of incentive plan to be used, it should be fully discussed with them.

Here again I recommend that the plan and its operation be discussed with the union committee prior to the plan's being presented to the employees as a whole. Any misunderstandings that the committee members may have can be cleared up at that time so that they will be in a position to support and to help explain the plan at the general meeting.

The standards, policies, bonus calculations, report forms, and everything else connected with the incentive plan must be fully presented and discussed. All questions should be answered and explained to the satisfaction of everyone concerned. Copies of the bonus standards and policies should be prepared for posting in the shop or at least they should be made readily available to any interested employee.

It is recommended that these meetings be held at the start of the shifts so that, at their conclusion, the workers can go to their work places with the discussions and explanations fresh in their minds, and with the aid of the supervision and engineers proceed to prove the standards in actual practice. These first days are critical, and the engineer must stand ready to correct any omissions or errors that become apparent under actual operating conditions. There are certain to be some mistakes in any incentive installation, and the speed and fairness with which the mistakes are overcome have much to do with the reception and sustained approval it receives from the employees.

E. Have a Permanent Pattern for Employee Relations in Regard to Technological Change. We know that no matter how thorough and painstaking a job has been done in modernizing and streamlining a department or plant, it will not remain static. There will be constant changes of a minor nature and occasionally a major change will occur. That is progress and we must seek it, because our model plant or department is only the best we can think of today. Tomorrow someone may devise a new machine or method that will make obsolete some portion of our process.

We must, therefore, maintain and foster our program of keeping our employees fully informed on current thinking and plans and seek their advice. This can be done by following the same pattern we have been discussing: by holding meetings with the employees when the matter is of sufficient importance; by holding discussions with the union committee and individual employees on a day-to-day basis, as items come up that are of general interest but not important enough to justify a general meeting. When a change occurs that affects a standard of work, or a method of work, it must be discussed fully with all interested parties before any change is made.

3. Program when representatives of the employees are going to be working partners on the project

The only distinction between this approach to the problem and the one we have been discussing is that here we have representatives of the employees working full time on the project as technicians. Otherwise the pattern can be the same, with the added impetus of having some of the fellow workmen of the hourly employees actually doing part of the development work.

Care should be taken in the selection of these hourly employees who will work with the engineers. Although the workers themselves should make the actual selections, the management should reserve the right to question any selection on the basis of the individual's experience and knowledge of the work in the department, and the degree of contribution he can make. This privilege would probably seldom be used, but it is important that the ablest employees who are eligible be chosen.

These employee assistants are taught to use the techniques and methods of the technicians. Thus they can contribute to the development of data and other information. In this manner they acquire at least sufficient knowledge of the techniques involved not only to understand them themselves but also to explain them to their fellow employees. One of the real values these employee assistants have is their knowledge of present methods and working conditions. Through this first-hand knowledge they can hasten the analysis and also aid both in preparing and in trying out the proposed new methods. They can also prove their value in helping to train the employees in the new methods and do much to convince them of the practicality of the new methods as well as the fairness of the incentive standards established for them. When the maintenance phase of the program arrives following the completion of the major project, these same men can be called upon when needed to assist the engineers

and also to review changes made in methods and standards to aid in obtaining their acceptance by the employees as a whole.

When a management has reached the point where their industrial relations are on such a high plane that they can openly invite this type of participation, they would do well to consider it favorably. They have much to gain and little to lose when they have this type of a relationship with their employees, organized or not. However, should the union insist on introducing outside union technicians, then management should proceed with great caution.

It has been my experience and observation that our own employees have an entirely different attitude from outside union members, and they desire to do a thorough job when they are members of such a participating group. Our own employees are personally interested in the success of the plant because it is there that they make their living. The outside union members are not so interested, and are in danger of being motivated by ideals and ideologies rather than doing a thorough unbiased job. Then, too, they may not only be incompetent technicians but may also lack an intimate knowledge of the work performed in that department or plant.

Should the plant union member participants request that their international union specialists be permitted to review the joint committee recommendations in the offices of the plant, under ordinary circumstances it would be entirely satisfactory to do so. However, before a management should agree to go beyond that point they should consider carefully the full import of such an agreement.

4. Suggestion system under such programs

If a plant has a regular suggestion system in operation it is important that a decision be made as to how it will be disposed of during such a study as we have been discussing. It is obvious that many suggestions made by employees would have already been thought of and planned for by the technicians or supervision. Yet it is difficult to convince any worker of this fact when his suggestion is involved. Then, too, when regular employees are working as members of the joint study committee, they will be developing many ideas that find their way into the final solution. This raises the question of how they should be considered in relation to the other employees and the suggestion system.

I believe that it is best to suspend the suggestion system completely during such a development period. This may be unfair to some workmen who turn in good ideas but it may prevent

many harmful and upsetting disagreements on the authorship of suggestions. Should there be any unusually fine suggestions, they could be singled out for some special reward.

An alternate method would be to suspend the regular suggestion system for the duration of the study and institute a special system. This special system would require a special committee to evaluate and adjudicate all suggestions offered in the light of the work of the joint committee. This special committee should contain employee members as well as management members, and its decisions should be final.

Conclusion

In this discussion of wage incentives I have endeavored to lay a general pattern of what should be considered in preparing to use incentive plans and also what should be included in an acceptable plan. Wage incentives are and can continue to be a valuable tool of management in its efforts to reward its employees properly and fairly and to control its costs. As such a tool, incentives will play an important part in the postwar industrial picture. It is, therefore, essential that both management and labor consider the proper development of wage incentive plans, and their use, so that each party will receive the maximum benefits from that use.

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